











SIMPLE  
OBJECT LESSONS  
FROM NATURE,

FOR THE UPPER CLASSES IN INFANT SCHOOLS AND FOR  
STANDARDS I., II., AND III.

*WITH OUTLINE ILLUSTRATIONS FOR THE BLACKBOARD,  
AND FOR USE AS KINDERGARTEN OCCUPATIONS.*

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LONDON :  
GEORGE PHILIP & SON, 32 FLEET STREET, E.C.  
LIVERPOOL: PHILIP, SON & NEPHEW, 45 TO 51 SOUTH CASTLE STREET.  
1896.  
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## **OF UTTARPARA.**

### **INTRODUCTION.**

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This book of simple Nature Lessons has been designed to supply a need which, it is believed, has been felt for some time by the Teachers in Infant Schools, and which, owing to the recent Instructions of the Education Department, is now felt by those who have charge of the Junior Classes in schools for older children.

The need has existed, not because of a lack of sources of information on the subject matter of this book, but because of a lack of books which deal only with those parts of the subject which are adapted to purposes of class teaching and of truly educational utility.

In drawing up lessons in Natural History and Botany, the difficulty of a wise selection of subject matter always makes itself felt.

Amongst young teachers particularly there is always a tendency, in lessons of this kind, to prepare a long string of facts, which they endeavour to cram into the children's minds.

At the present time, when it is necessary for teachers to undertake the teaching of so many and such various subjects, the wise selection of subject matter is of prime importance. All matter which does not admit of being imparted by intelligent and truly educational methods, as well as that which, by reason of its being of too technical a nature, is likely to prove burdensome to the children's minds, should be rejected.

It has been the aim of the writer of this book not to

write a series of formal lessons, but to present certain subjects for lessons in a simple, interesting, and suggestive manner.

The specimens for all the lessons will be easily obtainable. In many cases the children will be able to provide them themselves. For instance, a handful of buttercups, daisies, or dandelions, a bunch of primroses or snowdrops, will furnish each child in the class with a specimen, and make the lessons both valuable and interesting.

A long experience of Infant teaching, in which all that is contained in this book has been actually embodied in lessons for young children, has convinced the writer that the subjects are of such a character as will arouse and stimulate a true love for Nature in the children ; and will lend an additional charm to their walks and rambles, by allowing them to exercise the knowledge that has been imparted to them.

*INTRODUCTION.*

**METHOD OF USING THE DESIGNS AS KINDERGARTEN  
OCCUPATIONS.**

It is hoped that the Illustrations will prove helpful to teachers.

Every intelligent teacher knows the usefulness of connecting, as much as possible, one lesson with another. If a Nature Lesson is supplemented by an Occupation bearing on the same subject, that lesson is impressed on the minds of the children, and they are delighted to feel that they can reproduce, in a palpable form, the knowledge they have gained.

The Illustrations are intended for the teacher to use as Blackboard Sketches when giving the lessons, and for the children to use as Kindergarten Occupations.

At the first glance, the drawings may seem a little difficult for young children, but if they are looked into closely it will be found that they are placed on the chequered lines in such a manner as to make them fairly easy.

Many of the designs may be followed out in Brushwork, and the outlines may be used for Drawing, Perforating, Embossing, and Embroidery. If preferred, the shading may be left out in the designs.



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PRESENTED BY  
SRI NATH MUKHARJI  
OF UTTARPARA.

## PART I.—SIMPLE BOTANY.

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### INTRODUCTION.

As an introduction to this series of simple lessons in Botany, it would be well to talk to the children of the great world of Plant Life which we call the Vegetable Kingdom; to point out how the earth is clothed with vegetation in almost every part except cities and towns; to show how the green carpet of grass, the hedges, the wild flowers, the plants, so common as to be hardly noticed, the shrubs, the waving trees, although so different and so full of variety, are all plants, and grow and live by the same means.

There is a love of flowers in the hearts of all children, and it is only right that this love should be fostered, and that they should be led to enquire into the nature of plants, and to understand something of their wonderful structure and beauty, and their infinite variety.

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### CHAPTER I.

#### THE USES OF PLANTS.

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1. Plants beautify the earth.
2. They purify the air.
3. They provide food for men, animals, birds and insects.

1. The earth would be a very dreary place without the soft green grass, the bright flowers, the spreading trees.

How strange it would be after the cold Winter, with its frost and snow and dark skies, if Spring did not bring blossoms and opening leaves, if Summer did not give us a wealth of flowers and plants, if Autumn had no harvest of ripened fruits!

2. Plants keep the air pure for us by breathing in through their leaves that part of the air which is hurtful to people and animals.

When we breathe we take in good air. Then we send out air quite different from that which we breathed in. It is not good for us to breathe the same air again, but the plants like the air we have used, so they breathe it in and send it out purified and ready for us to use again.

It is the green leaves that do the greatest part of this breathing. This is one reason why it is good for us to live in the country among the fields and trees.

3. Plants draw their food from the air and the soil. Part of it is taken in through the leaves from the air, and part through the roots from the soil.

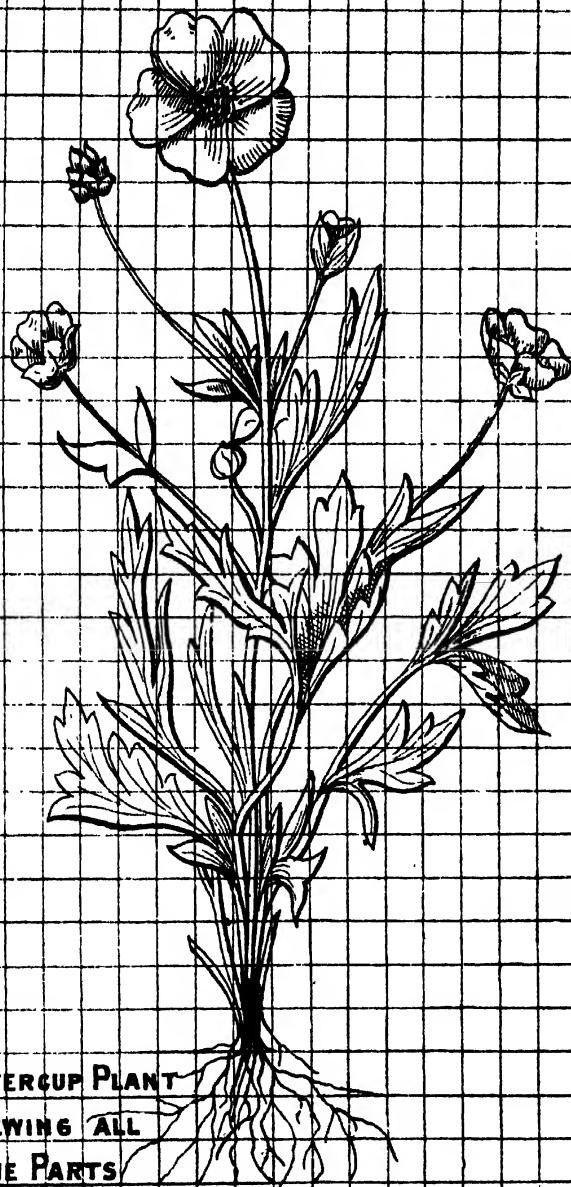
The roots take up moisture and other matters from the earth. This moisture runs through all the parts of the plant, and is called sap.

Plants grow from seeds—sometimes so small as to seem like dust. From these seeds they grow to plants ranging from the tiny weed to the great tree. They produce food, either directly or indirectly, for all living creatures on the earth.

Our commonest articles of daily food are obtained from plants, and the animals we use for food, when alive, have fed on vegetable productions.

Many plants are not good for food—some, indeed, are poisonous. Of those which are good for food we sometimes use the whole of the plant, but more often only part of it





BUTTERCUP PLANT  
SHEWING ALL  
THE PARTS

For example, it is the *fruit* of the apple-tree we use, the *leaves* of the cabbage, the *stem* of the celery, the *seed* of corn, the *flower* of the cauliflower, the *root* of the turnip, and so on.

(NOTE.—It is an interesting exercise for children to name any plants they can think of which are used as food, and to specify which part of each plant is used.)

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## CHAPTER II.

### THE PARTS OF A PLANT.

A Plant has Roots, Stem, Leaves, Flowers, Fruit,  
and Seeds.

The root is in the ground—that part of the plant which 1. **The Root.**  
we cannot see unless we dig it up.

It sucks up the moisture from the ground, and it also keeps the plant firmly fixed. Small plants have tiny, thread-like roots, but the tiny ones are of as much use to the little plant by nourishing and holding it, as the thick branched ones are to the great tree.

Roots are not all alike. They differ very much, but they all have the same uses. They send out little threads or suckers, which seek for moisture and cling firmly to the soil.

The stem grows upwards as the root grows downwards. 2. **The Stem.** It generally looks like a green pipe or cylinder,—sometimes slender and sometimes thick, according to the size of the plant. It must be hollow to allow the sap to run up and feed the leaves and flowers and fruit.

Stems may be upright, branching, creeping, climbing, &c.

[Plants with soft juicy stems, that die down at the end of the season to spring up again the following year, are classed as **Herbs**.]

Plants with woody stems covered with a hard skin, called bark, are classed as **Shrubs** and **Trees**. These do not die down at the end of the season.]

The stem bears the leaves and flowers.

Some stems throw out tiny fingers, with which they cling to objects and thus support themselves. These fingers are called tendrils. Some stems have prickles or thorns growing on them.

**3. The Leaves.** The leaves grow on the stem—some close to the ground, others here and there upon the stem, singly, in pairs, in rings, and in other ways.

They are of all shades of green, and every plant has differently shaped and differently tinted leaves. In shape leaves are round, egg-shaped, heart-shaped, long and pointed, notched round the edges, or with straight edges. There is no end to the variety in leaves—some are glossy and shiny, like the ivy; some are prickly, like the holly; and some sting if you touch them, like the nettle.

Some leaves have a sweet scent, some a disagreeable one; many have a pungent and aromatic scent.

It is through the leaves that the plant breathes.

**4. The Flower.** The flower is a very important part of the plant. It does not generally appear till the plant is fairly well grown.

The root, stem, and leaves of a plant nourish and support it, but the flower has a very different part to perform, as will be seen further on.

The flower grows upon a stem or stalk.

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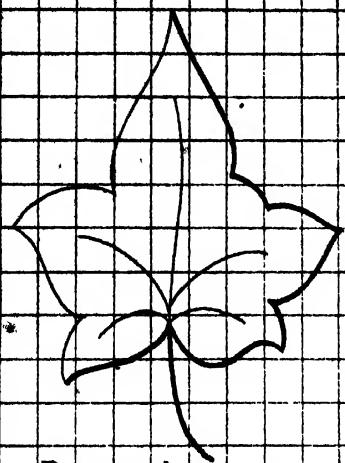
### CHAPTER III.

#### THE PARTS OF A FLOWER.

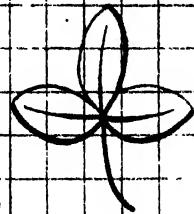
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The Calyx, the Corolla, the Stamens, the Pistil.

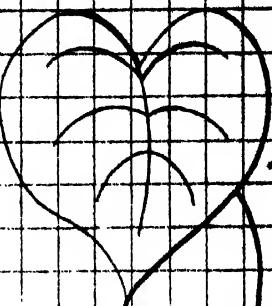
**The Calyx.** Before the flower opens it is called a bud. The outside coat or covering of the bud is green, and the flower leaves are



POINTED LEAVES



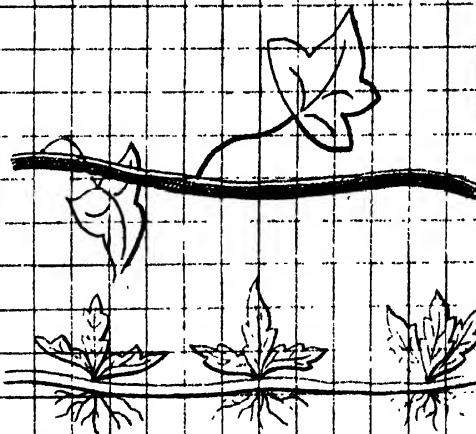
TREFOIL



HEART SHAPED LEAVES



UPRIGHT STEMS



CREEPING STEMS



CLIMBING STEMS



daintily and neatly packed within it. They are so closely folded one over the other that they take up very little room. But as the juices of the plant feed them and the sun warms them, they grow and swell until the green covering can no longer hold them. Then it splits open into divisions, and the flower leaves, which have been so tightly packed, uncurl and straighten themselves out. This is the "blooming" of the flower.

When the flower has bloomed, the green covering looks very different from what it did when the flower leaves were folded up inside it. It is now split up into narrow leaves, which form the calyx. The word "calyx" means "a cup." It lies at the back of the flower leaves, which spread out inside it. Every leaf of the calyx is called a "sepal." In a newly-opened buttercup the calyx can be very easily seen, but when the flower has been blooming a day or two it falls off. The size, shape, and colour of the calyx differ greatly in different flowers.

Some flowers have no calyx, in some the calyx turns back or drops off, while in others it remains long after the other parts of the flower have faded. In the primrose, the wild rose, or the pansy, the calyx can very plainly be seen, and in each of these flowers it is entirely different.

Corolla means "little crown" or "little garland," and is <sup>The Corolla.</sup> the beautiful cluster of flower leaves.

The corolla is the prettiest and most showy part of the flower. It is bright-coloured, perfectly shaped, and often has a sweet perfume.

The corollas of flowers are of all colours except green—it is very seldom that a flower is green. The corollas of the forget-me-not and speedwell are blue; the wild-rose and fox-glove, pink; the buttercup, the dandelion, and the primrose,

yellow; the poppy and geranium, bright red; the lily and snowdrop, pure white.

Every separate leaf of the corolla is a petal; some flowers have few petals, while others have a great number. For instance, a wild rose has five petals, while a garden rose has often more than a hundred.

**The Stamens.** The stamens are found in the centre of the corolla—they are a group of short, slender stalks, often as delicate as threads. Each little stalk has a lump or knob at the top of it. This knob is really a case filled with yellow dust. The threads, with their dusty heads, are stamens, and the dust is pollen. The pollen comes off the stamens easily when touched with the finger if the flower is fully grown.

The bees are very fond of it, and it is most useful to them, as is seen in the "Lesson on the Bee."

Some flowers have a number of these stamens, some have the same number of stamens as they have of petals, some have few, and some only one. By looking into the heart of the flower they may always be found.

The buttercup and the wild rose have many stamens, the lily and the wallflower have six, and the violet has five.

#### **The Pistil.**

There is one more part of the perfect flower—the pistil. If all the petals and stamens are pulled away from a flower there will remain the pistil. This is the seed-vessel, and is the central part of the flower. In the buttercup it is formed of small green bags, each one containing a tiny young seed.

When the different parts of the flower have all withered and fallen away, the pistil still remains, and the juices of the plant nourish the seeds, and they grow and ripen in course of time. Each different flower has its own particular kind of pistil, but every one contains seeds.

## CHAPTER IV.

## THE USES OF THE FLOWER.

Deeply hidden in the flower is a tiny drop of sweet juice. Bees and other insects love it, and do their best to get it. The bee knows where to find the drops of juice. But the juice is not meant for the bee unless it will do something in return to help the flower. The bee never thinks of this when it goes buzzing into a flower—it only thinks of the pollen and the juice for which it seeks. While it is thrusting its long tongue to the very bottom of the flower and sucking up the sweets it finds there, its hairy body rubs against the pollen, and some of the grains stick to it. So it flies away with the grains of pollen on its head, or its back, or the under parts of its body ; often it is powdered all over with gold dust. Then it enters another flower, and while working away in it, it will be quite sure to leave a few of the grains it brought with it from the first one. This is the very thing that the flowers want, although the bee neither knows nor cares anything about it. It is doing its duty when it is gathering the sweet juice and the pollen to take to the hive, and it never thinks about the grains of pollen that one flower is so careful to put on to its velvet body, and the next flower is so careful to take off.

The little grains that have been left in the strange flower by the bee fall on to a sticky substance above the pistil, which holds them fast. This substance nourishes them, and makes them grow and push down tiny, thread-like roots, which presently reach and touch the young seeds in the pistil.

From these threads, which are really tubes, the young seeds receive something which makes them fruitful. If the pollen grains did not fall on the sticky matter, and shoot out long slender tube fingers to touch the seeds underneath in this

wonderful way, the seeds would not ripen, and could not spring up again in new plants. The pollen grains must touch the seeds and give them this ripening substance, so that when they fall to the ground they will spring up in new plants. This is what is meant by making the seeds fruitful.

Some flowers can use their own pollen in this way, but most flowers like the pollen to be brought to them from their neighbours.

Now it is easy to understand why the flowers have such pretty shapes and bright colours and sweet scents. They wish the bees to find them easily, and they do all in their power to attract them. They invite the bees to visit them. They hide their sweet juice deep down so that the bee will be sure to rub its body against the pollen while looking for it. The flowers employ the bees to carry their pollen, and they pay them for doing it.

This seems a very wonderful thing, and we cannot exactly understand it all, but we are sure that the bees and other insects, and sometimes the wind, carry the pollen from flower to flower and make the seeds fruitful.

It is most interesting to watch a bee visiting the flowers in the garden. It will, as a rule, keep to the same kind of flower on one day, perhaps because the pollen and juice are all of the same kind. Sometimes the little creature will bury itself in a flower and stay there a little while, and the next time it will only put its head in and then buzz on to another. It can tell in a moment if some other bee has been there before it and has robbed the flower of its sweet store.





## CHAPTER V.

## THE FRUIT.

When the flower withers or falls away, the pistil remains. The plant continues to nourish it. It grows and swells, and the seeds within it ripen. It is then called the fruit.

The word "fruit" is generally taken to mean those ripe seed-vessels and seeds which are good for food—but all seed vessels are fruit. The holly-berry is a fruit just as much as the apple, so is the ripe pistil of the buttercup.

In some fruits the seeds are embedded in a soft, pulpy mass, that has a pleasant flavour, such as the raspberry, strawberry, and blackberry. The orange is a soft, juicy fruit, with a thick skin or rind. The seeds or pippins are enclosed in the divisions of the orange. In the apple and pear the seeds are found in little cells in the centre of the fruit; the cells are called the "core." In the cherry and plum the seed is only one, and is found enclosed in a hard shell in the centre.

The fruit of the pea, bean, wall-flower, and laburnum take the form of long-shaped pods enclosing the seeds. The fruit of the holly, hawthorn, and wild rose are bright red berries.

The fruit of many trees take the form of nuts. The acorn, the fruit of the oak tree, is a nut. The fruit of the chestnut, hazel, and walnut are also nuts.

Some plants have dry fruit—that is, the case or covering is dry—the seeds are not embedded in a soft, juicy substance, like the gooseberry and the cherry. Grasses, corn, and the poppy have dry fruit.

These are only a few examples of different well-known fruits. Plants have all their own special kinds of fruit, and many beautiful and wonderful forms they take.

## CHAPTER VI.

## HOW SEEDS ARE DISPERSED.

From the foregoing lessons it will be seen that, although flowers beautify the earth and give great pleasure to all who observe and study them, they have existed chiefly for the sake of the seeds.

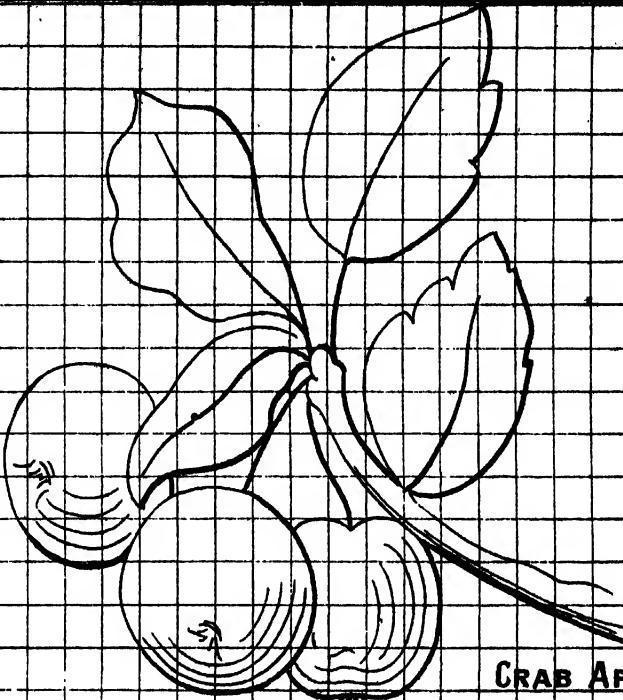
Many people seem to think that plants bring forth fruit specially for their use and pleasure. In reality Nature has designed the fruit to hold and protect the precious seeds, and, in many cases, to ensure them being carried to spots where they can find room to spring into new plants.

When the seeds are ripe they must be spread abroad. If the seed ~~of every tree and plant~~ were to drop exactly underneath, and there take root, it would be impossible for them to grow.

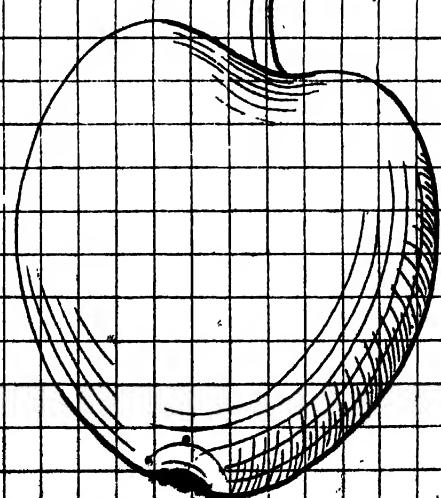
They would spring up in such numbers in a small space that they would soon be choked for want of air and room.

This does not often happen, for Nature has provided numerous methods by which seeds are scattered far and wide.

Many birds feed on the fruit of plants. As they fly away with the fruit they are sure to drop some of the seeds, which fall to the ground and probably take root. Ripe cherries are carried far from the tree by the birds, and after the soft, juicy part has been eaten, the stones containing the seeds will be dropped by them. So it is with many berries and other fruits—the birds carry the seeds far away from the plants on which they grew. Some plants have seeds which can fasten themselves to anything which touches them in passing. They will cling to the wool of sheep, or the feathers of birds, or people's dresses, and in this way they are carried away from the plant.



CRAB APPLE  
LEAVES AND FRUIT



APPLE  
(FRUIT)



Squirrels plant many a tree without knowing it. They gather acorns and nuts for food, and hide them safely for future use. Perhaps they forget all about this little hoard, or they may be prevented from returning to it. Even if they do return and eat the nuts they have hidden so cleverly, it is probable that they will leave one or two, and these will spring up into trees.

Many plants have feathery seeds, like the thistle and dandelion. When they are ripe they look like tufts or balls of silvery down. These silvery tufts of down are composed of a number of seeds, each with its little plume attached. The lightest breeze will bear them far afield.

The seeds of many trees are winged—that is, they have a wing or sail attached to them, and when they float down from the tree the wind catches the sail and they are borne away. The sycamore and the elm have these winged seeds.

The seed vessels of some plants can shoot their ripe seeds to a distance.

These are some of the methods by which plants gain their ends.

It is necessary that their seeds should be carried away from the parent plant, in order that they may have room to grow into new plants.

Not only does the scattering of seeds give the plants space and freedom, but it gives variety to plant life all over the earth. All the seeds that ripen and come to perfection do not spring up in new plants. Immense numbers of them are eaten and lost, but there are always a sufficient number that live and grow to clothe the earth with vegetation.

No one can explain or really understand the mysterious power that causes the seeds to spring into new plants. They lie in the ground, as if dead, all through the frosts and snows

of winter, yet, when the soft showers fall and the air is warm and mild in spring-time, the tiny germ of life hidden in each seed, even in the smallest, wakens and sends upwards a green shoot, and downwards a thread-like root, which, as time goes on, strengthen and grow into the perfect plant that blossoms and bears fruit in its turn.

## CHAPTER VII.

### FAMILY LIKENESS IN PLANTS.

Plants are divided by botanists into classes and families. When they wish to describe a plant they say it belongs to a certain family.

All the plants of one family are not exactly alike ; indeed they often look very unlike each other at the first glance, but if they are carefully noticed they will be found to have points of resemblance.

In a family of children no two of the children are exactly alike. They may be unlike each other in features, complexion, figure, or disposition, and yet they will have a family likeness, that is to say, it is easy to be seen that they belong to the same family. So it is with plants ; those of the same family may be very unlike in some ways, and yet in other ways they will resemble one another.

Thus we say that the strawberry and the rose belong to the Rose family. This seems very strange, because the rose is a shrub or woody plant, and grows up into a bush, while the strawberry is a soft-stemmed plant or herb, and creeps along the ground. Where then is the resemblance ? In the flowers of the two plants. The corollas and stamens of the wild rose and the strawberry resemble each other very closely indeed.

The wallflower and the cabbage belong to the same family, although they look so different. They, too, show the family likeness in their flowers. They belong to the family of cross-shaped flowers. Their flowers differ very much in size and colour, and yet each corolla is formed of four petals, which form a cross.

In this way, for the sake of convenience when describing them, plants are divided into families. Those plants which most resemble one another in important points of structure are said to belong to the same family.

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## CHAPTER VIII.

### FIRST FLOWERS OF SPRING.

#### The Snowdrop, the Crocus, and the Daffodil.

These three plants have bulbous roots and sword-like leaves. When a plant is said to have a bulbous root, it means that the part from which the roots spring is the base of the stem grown round and thick and solid. This thickened stem is called the bulb, and it contains a store of nourishment which helps to feed the young plant while it is growing. The onion is a good example of a bulb.

When a bulb is placed in the ground the roots strike down from it. From the top of the bulb the young leaves shoot up.

In these three plants the leaves are long, narrow, and pointed. This is why they are said to be sword-like.

When the ground is hard after the winter's frost and cold, these strong pointed leaves can easily push through it.

The coming of the snowdrop is the first sign of spring. It <sup>The</sup> <sub>Snowdrop.</sub> often comes up before the snow is off the ground. It gets its

name from this fact, and because it droops or drops its head. It is a very suitable name. It is a brave little flower to venture up before the winter has taken its departure. While the flower is a bud, it looks like a tiny snow-ball ; but when it is fully open it has three pure white petals, which resemble wings spread open for flying. Inside these petals is a bell-shaped corolla edged with vivid green.

**The Crocus.**

The crocus appears soon after the snowdrop. Its corolla has six petals, and the flower tube is very long. There is a very strange thing connected with the crocus. While the flower is blooming, it keeps its pistil hidden under-ground ; but as soon as the flower withers, it sends it up, and the air and sun ripen the fruit.

There are white, lilac, purple, and bright yellow crocuses. In some parts they grow wild, but as a rule they are cultivated in gardens.

On a sunny day in early spring, crocuses make the garden look very gay, their bright colours show up so well against the brown earth.

They are particularly welcome because they come at a time when the garden is bare, and the buds have not yet opened on the trees.

**The Daffodil.**

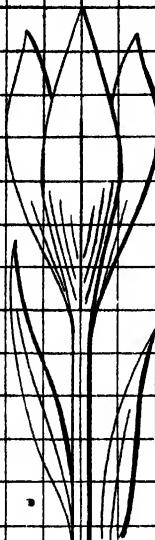
The daffodil comes in March, and is a very handsome flower. It grows wild in woods and orchards and low-lying meadows.

The flower has six outer petals of pale yellow, and a long bell-shaped inner corolla of a deeper yellow.

There are many varieties of this plant cultivated in gardens—some of them are sweet scented.

The large garden daffodil, the narcissus, and the jonquil belong to this same family of plants.

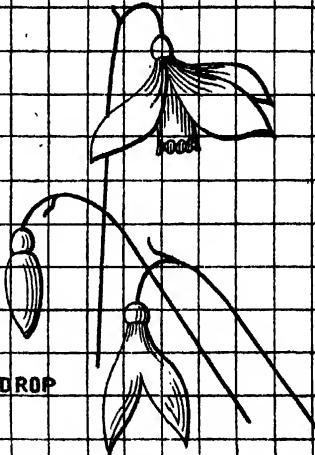
The word daffodil means the “flower that comes early.”



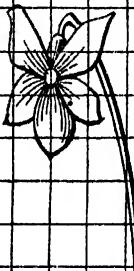
CROCUS



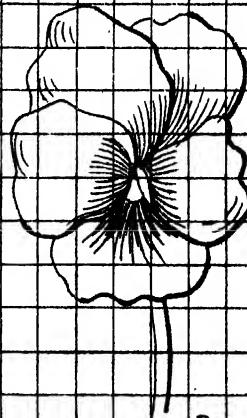
DAFFODIL



SNOWDROP



PANSY



PANSY



## CHAPTER IX.

THE VIOLET, THE PRIMROSE, AND THE  
BLUEBELL.

This pretty purple flower loves the shade, and hides under *The Violet*. Its large green leaves in the early spring-time. The leaves are heart-shaped. The flower has five unequal petals; the lower one is lengthened out into a little hollow tube at the back of the flower, called a spur. It is this spur which contains the little drop of sweet juice which the bee takes so much trouble to find.

The violet is often spoken of as the emblem of modesty and goodness. Its sweet perfume, quiet deep colour, and the lowly places in which it grows, have most likely suggested the idea. It gives its name to the colour "violet," which is a shade of purple. There is also a sweet-scented white variety.

The dog violet is much more common, and does not grow in the shade altogether—it is very often seen on grassy banks. It is smaller and paler in colour than the sweet-scented violet, but, for all that, it is a lovely little flower.

The structure of the flower is the same, but it has no scent; the leaves are small and heart-shaped.

It blooms at the same time as the primrose, and may be found growing on the same bank.

The colours of the two flowers harmonise beautifully.

The pansy belongs to the same family as the violet.

*The Pansy.*

The leaves are long-shaped and deeply cut. The flower is much larger than the violet, but it is formed on the same plan—it has five unequal petals and a spur.

Pansies are of very many colours—white, yellow, every shade of purple, from the palest lavender to a tint that is almost

black. Very often a petal of one colour will be tinged with a different shade.

The three lower petals are strangely marked ; these markings often make pansies look like little faces.

The pansy is a soft, velvety flower in appearance, and has a sweet, faint scent.

The name comes from a French word which means thoughts. It is often called "hearts-ease."

**The Primrose.** There is no flower of Spring that is so gladly welcomed by everyone as the primrose.

When its long-shaped, wrinkled, fresh green leaves and lovely pale flowers are seen, it is certain that Spring has come. Its name means "first rose." It has a long calyx, which forms a tube; the corolla is of a pale lemon-yellow. Some people think that it is not yellow at all, but a very pale tint of green. The crown or corolla of the flower is formed of one petal only. This petal has five divisions, which look like five distinct petals at the first glance ; but if it is noticed closely, it will be seen that the five divisions unite in a tube which rests within the green calyx tube. The stamens are not alike in all primrose flowers—in some they may be found halfway down the flower-tube, and in others just at the top of it.

In March or April a sunny bank covered with the pure starry flowers of the primrose is a most beautiful sight.

A bunch of primroses yields a very delicate scent—in a single flower the scent is hardly noticeable.

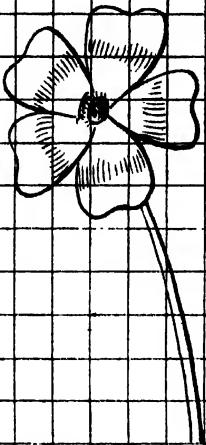
The polyanthus, cowslip, primula, and auricula all belong to the primrose family.

This flower is called by all children the bluebell ! It grows by thousands in the woods in Spring. Under the trees there are such masses of this pretty flower that they look like a deep-blue carpet covering the ground. It is one of the favourite flowers of childhood.

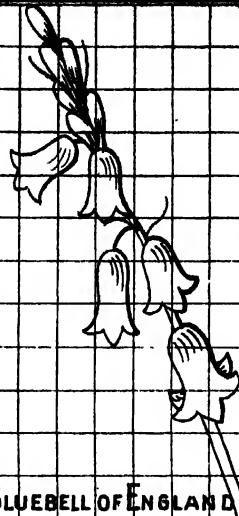




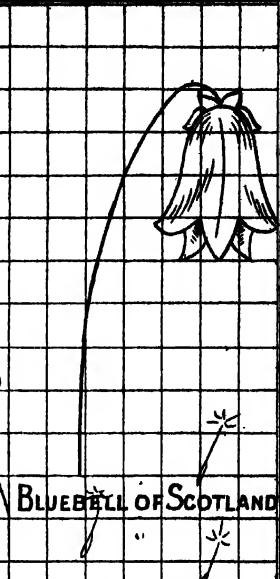
BUD



PRIMROSE



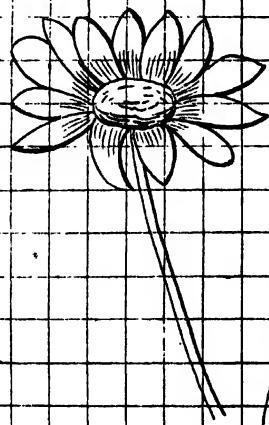
BLUEBELL OF ENGLAND



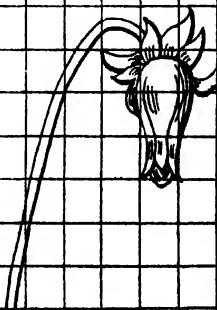
BLUEBELL OF SCOTLAND



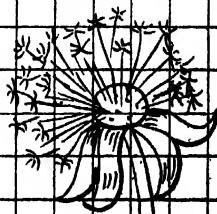
BUTTERCUP



DOG DAISY OR  
MARGUERITE



BENT HEAD OF  
DANDELION



DANDELION CLOCK  
(FRUIT)

The leaves are sword-shaped and glossy, the root is bulbous. The flower-stem is taller than the leaves, and supports a number of corollas. These corollas, which really are blue bells, grow one above the other on the upper part of the stem. The lower bells open first. The stalk and bulb are full of a sticky juice.

The cultivated hyacinth is much larger, and has many varieties of colour.

The harebell or hairbell, so called from its slender hair-like stalk, grows in single blue bells not so deep in colour as the wild hyacinth. It is fond of stony places and dry banks. The bell is so lightly poised on its slender stalk that it nods its head in every breeze.

This flower is the "Blue Bell of Scotland."

The Bluebell  
of Scotland.

## CHAPTER X.

### FLOWERS OF THE MEADOWS.

#### The Daisy and the Buttercup.

These are the children's flowers. Every child knows and loves them, and they are so plentiful and so common everywhere that most children are able to obtain them. They grow in grassy fields and by the waysides.

The daisy appears before the buttercup. It is a little The Daisy. flower, but though so small, it is composed in a very wonderful manner.

Instead of being one flower, as it seems, it is in reality a number of flowers all joined together.

The little yellow cushion in the centre is made up of tiny corollas, each one a perfectly shaped tube-flower, containing its

own stamens. These cannot be seen without the aid of a strong glass.

When a number of very small flowers are joined together in this way, to form one head, they are called "florets," a word meaning "little flowers."

All round the mass of yellow florets, which make the daisy's centre, is a row or ray of white strap-shaped florets without stamens. These white florets are often tinted with pink on the under side.

In the evening when the sun goes down, or if the day is dark and cold, the daisy closes its flower. Then the pink tips may be easily seen.

As soon as the morning sun touches it, it opens wide like an eye. This is how it obtains its name—day's eye, which has grown into daisy.

The large handsome daisy which flowers in June, and is called the ox-eye daisy, the dog daisy, or the Marguerite, and the bright yellow corn marigold, are both near relations of the modest little daisy.

**The Buttercup** The buttercup is a very good contrast to the daisy. The leaves are branching, and the flower stalk long. The corolla has five bright yellow glossy petals—as yellow as butter. These petals form a cup. The calyx behind the flower cup is divided into five sepals, so that there are five petals in the corolla, and five sepals in the calyx ; but the stamens are numerous.

When the buttercup has been blooming a few days the calyx drops off. This is why some buttercups seem to have no calyx. There are many varieties of buttercups.

## CHAPTER XI. FLOWERS OF SUMMER.

### The Dandelion, the Wild Rose, the Honeysuckle, and the Poppy.

This is a very interesting and beautiful flower, although <sup>The</sup> ~~Dandelion.~~ it is so common that it is rarely noticed. Its name means "lion's tooth," and it takes this name from the peculiar way in which the edges of its long-shaped leaves are cut.

The flower-stem is hollow, and filled with a bitter, milky juice. What seem to be the numerous petals of this bright yellow flower are, in reality, separate corollas. It resembles the daisy in its structure, that is, the flower-head is composed of numerous florets. It belongs to a division of the same order as the daisy.

When the florets have bloomed and fallen away, the flower-head bends downwards. After remaining in this position for a few days, while the seeds are ripening, the dandelion raises its head, and the well-known feathery seeds are displayed.

They look like a soft, silvery ball, and the slightest breath of wind bears the plumed seeds far away from the mother-plant.

Children delight in gathering the dandelion "clocks," as they call them, and blowing them, to tell the time of day.

The seeds are carried away by the breeze, and they settle down in every field, and spring into new plants.

It is no wonder that the farmer heartily dislikes them, for they spread very rapidly, and are very hard to get rid of.

The wild rose may be called the Queen of wild flowers, <sup>The Wild</sup> ~~Rose.~~ because from it have sprung all the numerous and beautiful

varieties of roses which grow in our gardens. It is a shrub which grows in hedges. The stem is prickly and woody; the leaves are glossy, and grow in pretty sprays. The flower is pale pink, rose colour, or creamy white, and has a delicate fragrance. It has five petals, and a large cluster of deep-yellow stamens. The garden rose has many petals, but that is because the stamens have grown into petals through being cultivated.

The wild rose and many garden varieties flower in June. June is often spoken of as the "month of roses."

The fruit of the rose is called the "hip." It is a long-shaped, bright scarlet berry, and in the end of summer makes the hedges look quite gay.

**The  
Honeysuckle**

The honeysuckle is the companion to the wild rose, for it flowers at the same time, and may often be found growing in the same hedge. The flower is composed of a number of long tube-shaped corollas, tinted yellow or pink. It has a most delicious perfume. At the base of its long flower-tubes lies the honey, from which it takes its name.

It is a climbing plant, and twines its branches round the stems of shrubs and trees. It is often called "woodbine," which really means *wood-bind*. It takes this name because of its habit of twisting itself through the hedges, and binding itself round every stem it meets.

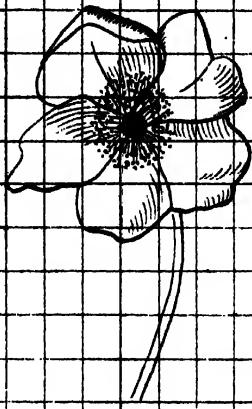
The fruit is a small, red, juicy berry. The corollas grow in clusters, so the berries grow in clusters too.

**The Poppy.**

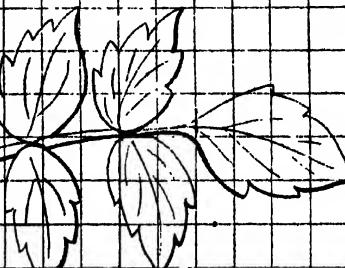
The wild poppy, which grows in cornfields and in waste places, is much admired because of its bright, red colour.

The leaves are long-shaped, and much cut up; the stem is hairy.

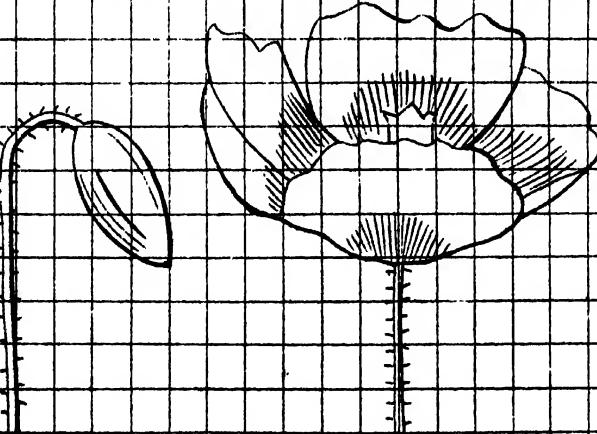
Before the flower-bud opens it hangs its head, but when it blooms it raises it. The poppy blooms from bud to flower.



WILD ROSE



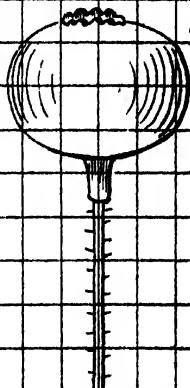
POPPY



BUD

FLOWER

FRUIT





very quickly. The green covering of the bud splits into two sepals, and falls off. These sepals look exactly like little green cups.

When the flower first opens, the petals have a very crumpled appearance—they have been packed up so tightly in the bud—but they soon straighten themselves out. It has four large scarlet petals, which are often black at the base. The stamens are numerous, and are very dark coloured; they surround the pistil, which is very plainly seen in the centre of the flower.

The poppy is only in bloom about a day; the flower petals soon drop. The slightest touch will often send them fluttering to the ground. The pistil is left, and it grows to a large size. Unlike the bud, it holds itself very erect. One poppy-head, as the fruit is often called, contains hundreds and hundreds of seeds as fine as dust. The bright scarlet poppy with four petals is the wild one, though there are some varieties found wild which are yellow.

There are many different colours in the garden varieties; some of them are beautifully variegated. When cultivated, the stamens grow into petals, thus forming double poppies.

## CHAPTER XII.

### TREES.

Trees are woody plants which grow to a great size. Shrubs and vines are woody plants also, but they are much smaller than trees.

The stem of a tree is called the trunk. It is very thick, and is covered with a hard, tough skin, called bark. The

stems of small plants are soft and green, but the trunk and branches of trees are hard and woody.

Trees are objects of beauty, with their stately trunks, waving branches, and rich, green leaves. They give a pleasant shade in the heat of summer, and render the landscape beautiful.

In addition to this they purify the air. When the air has been breathed by people and animals, it is unfit for further use. But the trees breathe it in, and keep that part of it which is hurtful to human beings. They like it, and it is their food. Then they make the air pure and fresh once more. It is the green leaves which do this breathing, and that is why the air of the country is so much purer than that of towns—there are more green leaves to freshen and purify it.

Trees provide men with many useful articles. The timber that is used for building ships, and for all other purposes, is obtained from trees.

They yield immense quantities of food for men, animals, birds, and insects.

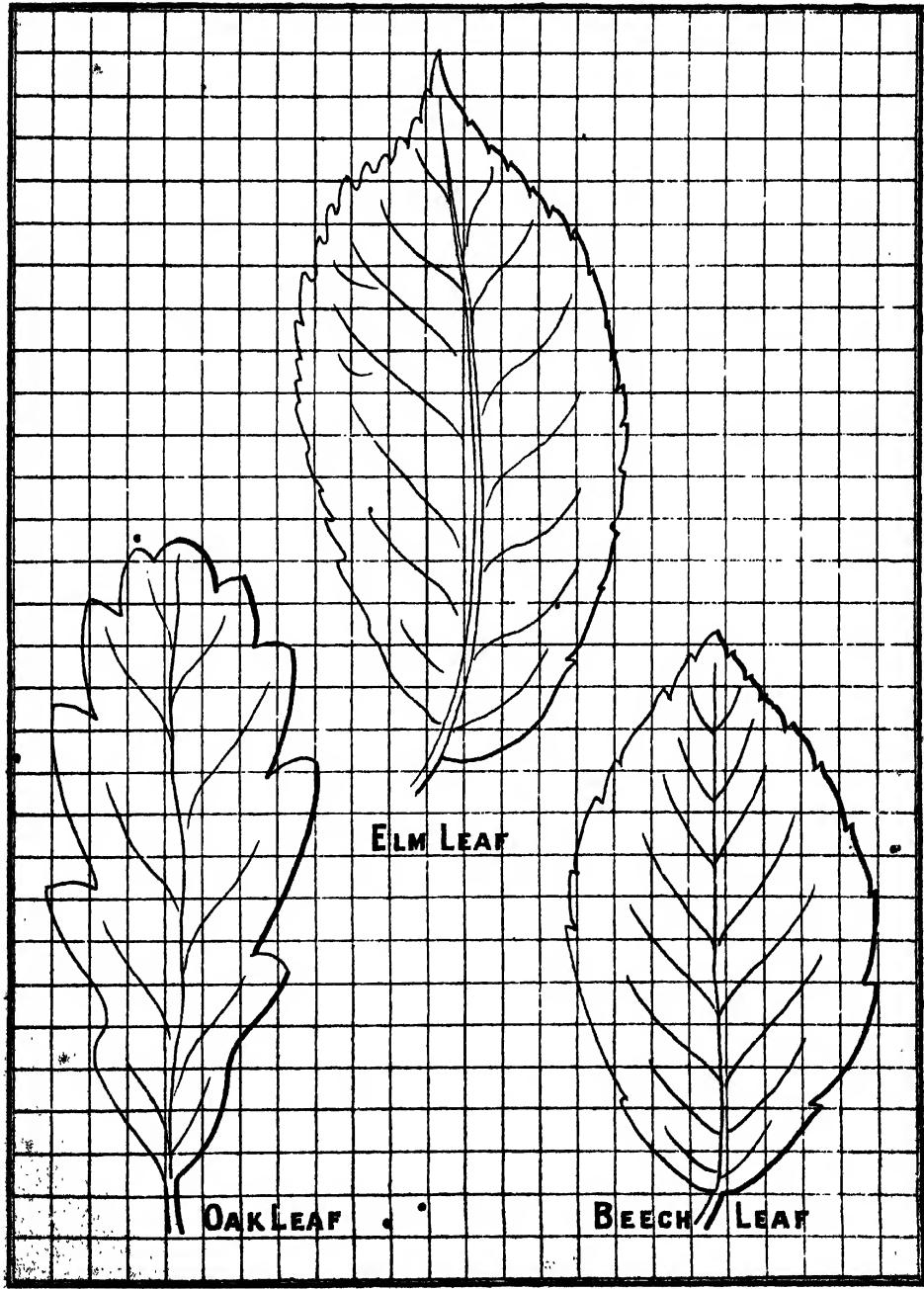
#### **The Oak, Beech, Elm, Sycamore, and Ash.**

##### **The Oak.**

The tree that takes the place of honour among British trees is the oak. It has a massive trunk, with rugged bark, and thick, twisted, wide-spreading branches. The branches of some trees grow upwards, but those of the oak spread outwards.

The leaves are three or four inches long, round at the end, and curved in and out along the sides. They are of a beautiful green tint in the spring, and in the autumn they turn yellow and rich brown before they fall.

When the leaves are partly open, about the end of April or beginning of May, the flowers come. They are very small,



OAK LEAF

ELM LEAF

BEECH LEAF



Many large forest trees have small insignificant-looking flowers. The fruit is a smooth oval nut, fitting into a perfect cup, that looks on the outside as if it had been carved. It is called an acorn.

Squirrels are very fond of acorns, and it is owing to them that many an oak tree is planted; for if the acorns fell and lay under the tree they might sprout, but they would never grow into trees—they need to be carried into an open space before they will do that.

There is abundance of life in an oak tree. Birds live and rest among its branches, and myriads of insects find a home and food among its leaves. On hot days cattle like to rest in its shade.

The oak-apple, which is about the size of the crab-apple, is not a fruit at all, but is produced by a winged insect. This insect pricks a bud and makes a small hole in it, in which it lays its eggs. The place that has been pricked swells and grows until it is the size and colour of a little green apple. From the wound in the bud which the insect has made, the sap is let out, and it is the sap which forms the oak-apple. In reality, it is a home for the little grubs when they emerge from the eggs which the mother insect has placed there.

Not only does the oak harbour living creatures among its leaves, it provides a home for mosses and ferns. They may often be seen growing on its branches far out of reach.

Although the root of the ivy is in the ground, it is very fond of climbing up the oak, and clothing its trunk with its rich glossy leaves.

The oak is noted for living to a great age. Many oaks live for hundreds of years.

What a wonderful tree it is, and how much there is to admire in it! It lives to a good old age; it stretches out its

arms and gives a pleasant shade in the hot weather ; it shelters and feeds birds and numberless insects ; it supplies some animals with food ; from it is obtained hard, strong, lasting wood for shipbuilding and many other purposes ; it supports mosses and ferns, and the ivy clings to it ; and in all seasons of the year it is an object of beauty.

It is with good reason that it is called the “monarch of the woods,” and it is no wonder that it has become an emblem of all that is strong and trustworthy !

**The Beech  
Tree.**

The beech is among the largest of forest trees. It is a very beautiful tree. When in leaf it has a rounded appearance.

The smooth grey trunk rises like a pillar for many feet above the ground. The larger branches also rise straight up from the trunk, but they throw off smaller branches which bend downwards. This is what gives the tree its rounded appearance. When looked at from underneath, the main branches, with their smaller arched branches, look like pillars supporting a roof.

The leaves are from two to three inches in length. While they are buds they have a lovely pink colour, and soon after they open they have a delicate fringe of hairs, which they lose as they grow older. The leaves are of an oval shape, and very smooth and silky. They open early in May, and a beech tree covered with tender green leaves is a very beautiful sight.

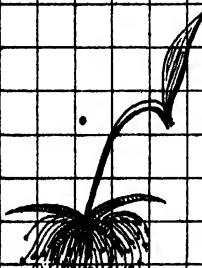
The flowers appear shortly after the leaves open. They are little, round, soft clusters, and are very numerous.

In the autumn the leaves become bright yellow, and when the sun shines on them the effect is most brilliant.

The fruit is a prickly pod, containing a smooth, three-sided seed. The pod splits into four divisions when ripe, and the seed falls to the ground. Children are fond of playing with the seeds. They gather them and thread them for necklaces, &c.



FLOWER AND FRUIT OF OAK



EMPTY  
SEED VESSEL      SEED

FLOWER AND FRUIT OF BEECH



FLOWER AND FRUIT OF ELM



Insect life does not flourish among the leaves of the beech, as it does among those of the oak, nor do birds often build in the branches.

The wood obtained from the tree is light brown, hard, and fairly strong and durable:

The elm is a very stately tree, and attains a great height. [The Elm Tree.](#) The trunk is massive and upright; the principal branches spring outwards from the trunk. These divide into branches again, and so form a rounded top. The bark is grey and rugged.

The leaves are oval and pointed. They are rough to the touch, and have edges that seem as if they had been unevenly cut in and out.

[When a leaf is cut in this way it is said to be "serrated."] A principal vein runs down the middle of the leaf, and ends in the point dividing it into two parts. It is a strange thing that at the base of the leaf one of these parts is lower than the other.

The flowers appear before the leaves, while the branches are still bare. They come out along the branches in small dark knots.

When open, they are tinted with brown, purple, and green.

These flowers are wind fertilised, that is to say, the breeze carries the pollen from one flower to another.

The flowers come in early Spring, before the bees have commenced their season's work. In the case of the lime-tree the flowers appear late in summer, and fill the air with their perfume. They are full of honey, and the bees are busy among their blossoms all day long, carrying the pollen from one to the other. But as the flowers of the elm-tree come so early, they have to depend on the wind to fertilise them.

When the flowers fade, the pistils grow into winged

vessels, containing one seed each. As they fall from the tree the wind catches their wings and carries them far and wide.

Rooks are very fond of elm-trees. They build their nests and make their homes in them.

When a colony of rooks return to their homes in the evenings, the neighbourhood of the elms, in which they live, is a busy and noisy scene.

The wood of the elm is very hard and useful.

**The Sycamore** The sycamore is not as grand a tree as the beech or the oak, but it attains a great height at times, if it has space in which to expand, and it is a picturesque tree.

It differs very much in its leaves and fruit from any tree mentioned before.

When in full leaf it has an oval appearance.

The flowers are very abundant, but not showy.

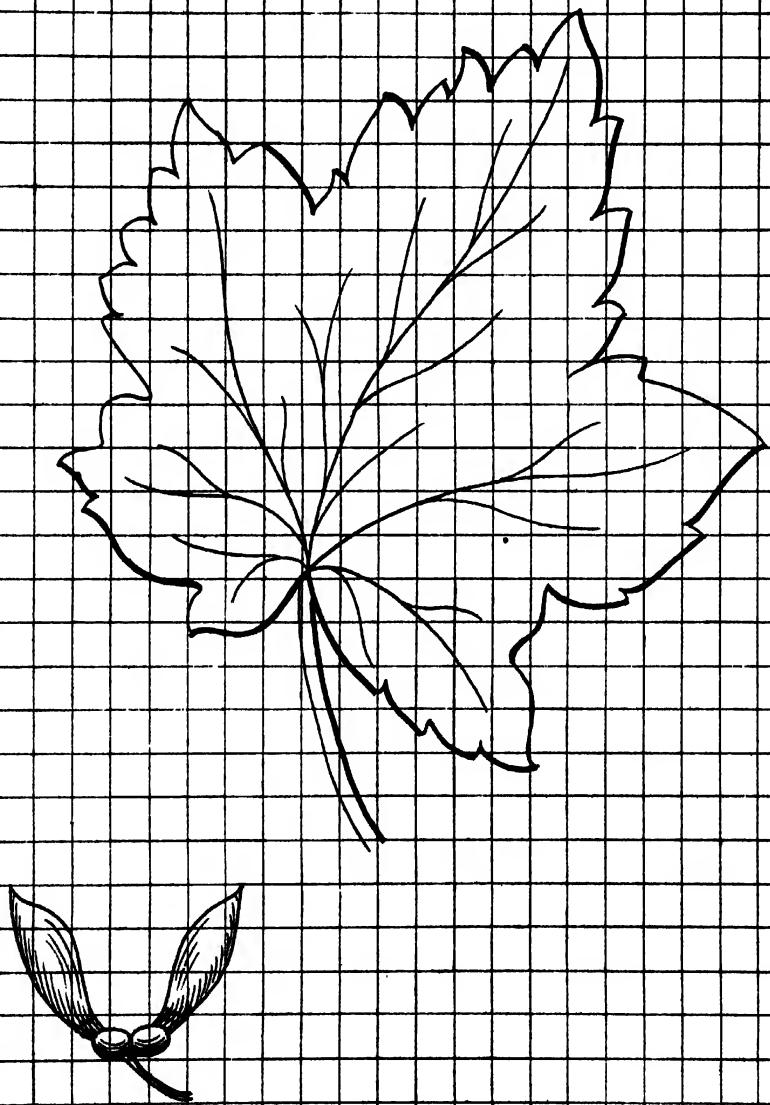
The leaves, while in bud, are folded up, and when they once begin to unfold they open very rapidly, and spread out like a fan. The maple is the only other forest tree that has its leaves shaped on the same plan. The leaf is composed of five large divisions, which run out to points ; the middle one and two upper ones are about the same size ; the two lower ones are smaller.

In the maple leaf the ends of the divisions are blunt instead of being pointed.

The fruit of the sycamore is very peculiar. The seeds are double, and provided with a pair of wings. These wings carry them into all kinds of situations, high and low, where they easily take root. The fruit of the sycamore and maple are very much alike.

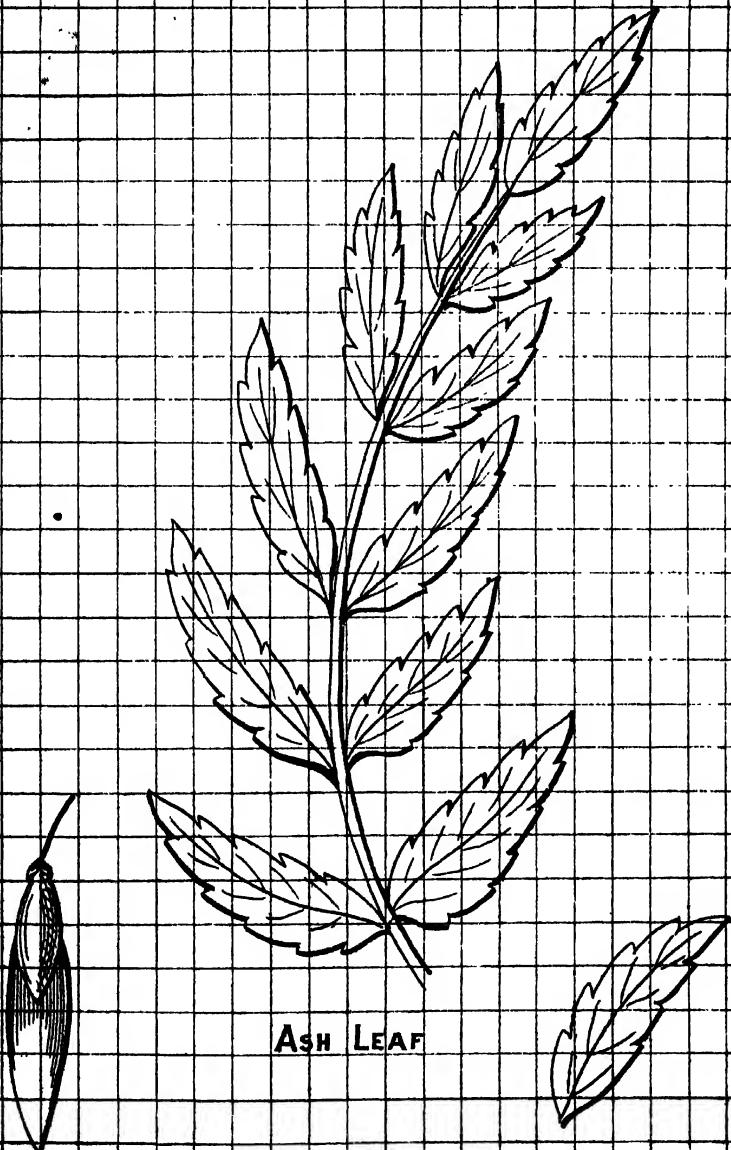
**The Ash.** The spring is well advanced when the leaves of the ash-tree open. As a rule it is the last tree to burst into leaf.

Its leaves are unlike those of any tree named before.



**SYCAMORE LEAF AND FRUIT**





ASH LEAF

ASH KEY

SINGLE LEAF



Instead of growing singly, they grow in pairs along a slender stem, and finish off with an odd leaf at the end of it.

The leaves, although the last to open, fall early in the autumn, and they have no brilliant tints like those of the beech and the maple.

The flowers are dark in colour, and very simple ; they bloom before the leaves open.

The fruit is winged, and grows in bunches, which often remain upon the branches all through the winter. They are commonly called "keys," and provide natural playthings for children. It is a favourite pastime of children to throw them up into the air, so that they can watch their curious downward flight.

The ash is a graceful and noble tree. It forms a lovely contrast to the other trees, because its feathery leaves give it such a light, airy appearance. The lower branches droop, but at the ends they curl upwards.

The mountain ash, with its clusters of scarlet berries called rowans, is not related to this ash at all. It belongs to the Rose family, while the ash belongs to the Olive family.

## PART II.—INSECTS.

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### CHAPTER I.

#### DEFINITION OF AN INSECT.

It is not very generally understood what an insect is. Many people would say, if asked, that an insect is a little creature that creeps or flies. But that is really no definition of an insect.

**1. The Body.**

An insect may be simply described as follows :—

An insect's body is composed of rings; it has no bones. The harder part of the body is outside ; the softer part is inside.

**2. How an Insect breathes.**

It breathes through tubes which run all through its body, and pass through its limbs. A child breathes through his lungs, a fish breathes through its gills, but an insect breathes all over its body.

**3. The Division of the Body.**

The body is divided into three parts. The word "insect" means "cut into". These three natural divisions are called—

- (a) The Head.
- (b) The Thorax (or Chest).
- (c) The Abdomen (or Stomach).

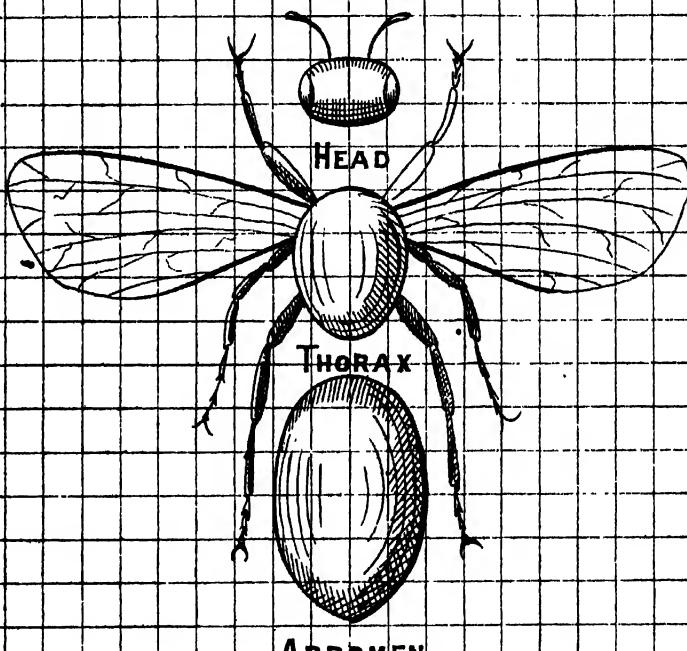
The head carries the mouth, two eyes, and two feelers.

The thorax (or chest) carries three pairs of legs below it, and one or two pairs of wings above it.

The abdomen (or stomach) sometimes carries a sting, and sometimes a special instrument for boring holes in which to place the eggs. This division never carries wings and legs.

An insect passes through certain changes in its life before

**INSECT**





it becomes a perfect insect. It may have four distinct states, and it passes from one to the other. These four are :—

- (a) The Egg.
- (b) The Larva, which is the grub or caterpillar.
- (c) The Pupa or chrysalis.
- (d) The Imago or perfect insect.

4. The changes through which an Insect passes.

NOTE.—A spider and a centipede are often called insects by mistake. They have only two divisions in their bodies instead of three, and the spider has *four* pairs of legs, and the centipede about *twenty*, so that neither of these little creatures is an insect. They both belong to other divisions of animals.

### The Three Natural Divisions of an Insect's Body.

The head is the first division, and is generally harder than the other parts. It often comes in contact with hard substances, so that it is necessary it should be strong.

Some insects have mouths with which they can break solid substances ; some have mouths with which they can suck up fluids. Their mouths are formed in the way best suited for eating the food which they require.

The eyes of insects differ very much ; some are small and flat, and they cannot see very far with them. Others are large and round, and have a wide field of vision, that is to say, they are large in comparison with the insect.

The size of the eyes depends principally on the food of the insect. If the food is close to the place in which the insect lives, and easily found, it does not need such good sight to look for it. But if it has to seek its food, then it needs keener and better sight to enable it to find it.

The horns are fixed to the head, and are always two in number. They are jointed, and the insect can move them in any direction. They are used as feelers, and it is supposed that, if insects have hearing, it is with these horns they hear. But no one is quite sure whether they can hear or not.

**The Thorax  
or Chest.**

This is the second division of the insect. All insects have six legs. It may not always seem to be the case, because some of the legs may not easily be seen on many insects—perhaps they are not properly grown—still they are there. These legs are in pairs. With them insects walk, swim, and jump.

The thorax also carries the wings. Most insects have four wings. In those insects which have only one pair, the second pair seem to have grown into *balancers*. These balancers help to balance the insect when flying.

The wings cannot always be seen easily, for some insects usually keep them folded up. But the wings of those insects which fly can be seen most plainly.

**The Abdomen  
or Stomach.**

The abdomen is really the stomach of the insect, and is generally larger than the other two divisions. It has neither legs nor wings attached. It has sometimes a sharp instrument, by means of which it can bore holes in solid substances in which to hide its eggs. It sometimes has a *sting*, but many insects have neither the borer nor the sting.

## CHAPTER II.

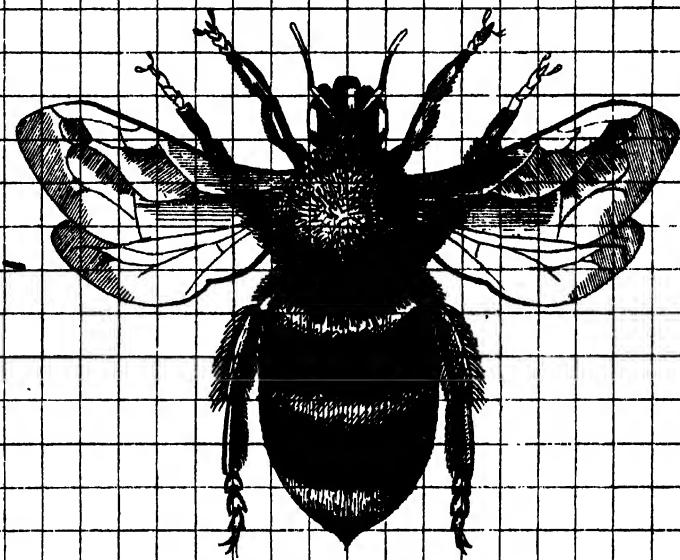
## DESCRIPTION OF THE BEE.



The bee may be seen any fine day in spring, summer, or autumn, in the garden or fields, visiting the flowers and the blossoms of the shrubs and trees. This is the working-bee. It is a pretty little insect about half an inch long, of a reddish brown or black colour, with smart yellow bands running round its body. It has two pairs of light gauzy wings.

The female or queen-bee has a longer body than the working-bee; the male-bee or drone is also a little larger.

BEE (ENLARGED)



LARVA OF BEE

PART OF LEG  
SHOWING HOOK



The worker and the queen have stings, but they do not often use them, except in defence. The drone has no sting.

The working-bee is a most wonderful little creature. It is liked by everyone, because it is so clever and industrious, and minds its own business. It has tools, a trunk, hooks, brushes, pockets, a bag, two baskets, and a sword.

Its tools are its mouth and legs—with them it does all its building and other work.

The trunk is a long tongue, with which it can reach down into the flower, and suck up the sweet juice contained in it.

The bee has tiny hooks at the end of the legs, by which it can hang or cling.

The brushes are hairs on the legs, with which the bee can brush its body all over when covered with pollen from the flower.

The pockets are little spaces under the rings of the stomach, in which the wax is formed.

The bag is one part of the stomach where the bee can store the juice until it can take it to the hive and put it into the cell.

This is not *eating*, it is simply *storing* while carrying home. It is in this bag that the juice changes into honey.

The baskets are little hollow places in the two hind legs, surrounded by stiff hairs, in which it carries the little balls of pollen which it has gathered from the flowers.

The sword is the sting which is at the extreme end of the body. The bee can thrust it sharply into any creature that hurts or vexes it.

## CHAPTER III.

## THE LIFE HISTORY OF THE BEE.

**The Swarm.**

When a number of bees wish to have a home of their own, they may be found, in the spring time, hanging in a mass from the branch of a tree. There will be one queen bee and a large number of others. They will hang lightly together there for a while. Some of the bees will hook on by their little hooks to the branch, others will hook themselves to the hind legs of those attached to the branch, and there they hang, row after row, in hundreds—one row hooked on to another till they form a mass. This mass of living bees is called a swarm. If people wish to keep the bees for the sake of their honey, they will bring a hive, turned upside down, and will gently shake the mass of bees into it. They must be careful that their hands and faces are covered, for fear some of the bees settle on them and sting them.

When the hive is turned down on a bench, in a garden, the bees settle down in it and make it their home. If a hive is not provided for them, they will presently go off altogether, and find a home for themselves—some hollow place where they can build their cells, and nurse and rear their young ones.

**The Hive.**

The hive is generally made of wood or straw, and is often shaped something like a bell. It is wide and circular at the base, where it rests on the bench, but grows narrower towards the top. There are however many shapes of hives.

When the bees settle down they begin at once to work. They creep all over the inside of the hive, and if there are any cracks or openings they will stop them all up, except the entrance.

They will then set about making the cells in which to store the bee-bread and honey. These cells are called the

honeycomb. They also make cells in which the queen-bee will place her eggs.

The first thing they do towards making the cells seems rather strange. They hang from the roof in a cluster (one attached to the other), quite still. It is during the time they are hanging from the roof that the wax is forming from the honey which they have already gathered.

It will appear in tiny scales, under the rings of the abdomen. From these pockets they take the wax they have thus so curiously digested from the honey, and collect it, until they have a lump sufficient to build with.

The cells are little boxes made of wax, six-sided, and fitting close to each other. A great number of these cells fitted together form the comb. They are perfectly even and regular, and all of the same shape and size.

When all is ready inside the hive, a number of the working-bees commence the work of filling the honeycomb and the cells for bee-bread in good earnest. Besides this, it is their business to provide food for all the workers inside the hive.

There is only one female bee in the hive—this is the Queen Bee. She is the most important member of the whole community.

She lays all the eggs from which the young bees come. She does not go out like the workers ; she very rarely leaves the hive. She stays at home, and the bees feed her and care for her.

They defer to their Queen in every way ; they follow her about and behave very politely, and pay her every possible attention. They are most careful that no harm comes to her. If another Queen Bee were to come into the hive, she would kill her, and the bees would help her to do so.

**The Working Bees.**

As soon as the sun begins to feel warm in spring, and the flowers are blooming, numbers of bees may be seen hard at work, from morning till night, in the gardens and fields. They go from flower to flower, making a humming noise that we call buzzing.

They are gathering the pollen and sweet juices from the blossoms. When a bee enters a flower, the pollen or yellow dust covers its body. This it brushes off its body, moistens with its mouth, and rolls into tiny balls, which it places in its baskets, and carries home.

Bees may often be seen so heavily laden that they can hardly fly. If a flower does not give up its pollen to the bee very readily, by dusting the little creature all over with it, the bee knows how to take it from the flower. The flowers like the bees to come and take their pollen away, and this is why they hide a tiny drop of sweet juice deep down in their cups. They know the bee will come for it, and it is while it is going after the juice that they dust it with pollen. Why the flowers wish the bees to visit them is explained in the Flower Lessons.

The bee takes the juice and the pollen too. It can thrust its trunk right down into the flower, no matter how deeply the drop may be hidden, and suck it up and carry it home in the bag it has for the purpose. It is while in this bag that the sweet juices change into honey.

The bee-bread made from pollen, and the honey, are the food of the bees.

All the honey is stored in the cells except that which is eaten day by day. When a cell is full, the bees close it up with a door of wax. It is fastened so tightly that no air can get in. If the air came in contact with the honey it would spoil it.

In this way the bees secure a store for the young ones, and for the whole of the bees during the cold weather, when no honey can be gathered.

All the bees of the hive are not occupied in gathering honey. Some stay at home and take care of the Queen, and nurse and feed the young bees.

The Nurse Bees.

When the larva or tiny grub comes out of the egg, it cannot feed itself as most grubs and caterpillars can, so the nurse-bees feed and tend it. The little grub eats and grows fat, and the time comes for it to undergo a change. The nurses fasten it into its cell, and shut the door on it, leaving just a tiny hole. The little inmate spins itself a silky coat. This silky substance it draws from its mouth. When wound all round it is called a cocoon. Then the pupa or chrysalis, as it is now called, lies quiet inside the cocoon without eating or moving for about eight or nine days. After this time it breaks right through the wax door, and makes its way out of the cell a perfect bee. The other bees help it, and take care of it until it grows strong and able to work. This does not take long, and if it is a working-bee it is soon hard at work like the rest.

The time that elapses from the placing of the egg in the cell by the Queen until the perfect bee emerges is about twenty-one days. The egg which becomes a Queen is placed in a larger cell than the others, and the grub is fed with a richer kind of food.

It is the duty of some of the bees to clean the cells when the young ones have done with them, so that they can be used for storing honey. Sometimes, if it is very hot weather, and the inhabitants of the hive very numerous, the air becomes impure. When this happens, a number of bees will ventilate the hive by fanning with their wings.

Other Working Bees.

Other bees guard the entrance of the hive to keep out intruders. They will touch all that enter with their feelers, to see if they have a right to be there, and they know at once if any enter who do not belong to the hive. Then, if enemies intrude, they do their best to banish them.

Sentinel Bees.

Often moths and wasps try to get in—they would like the honey that the bees have stored. The bees rush upon their unwelcome visitor and sting it to death, and push it out of the hive. Sometimes a slug or a snail will blunder in. After the bees have succeeded in killing it, they perhaps find they cannot push it out, for it is too large. They know quite well that if the dead body should remain there it would decay, and render the air unhealthy and impure.

So they adopt another plan.

Many trees have a sheath on the leaf-buds before they open—this sheath is covered with a substance which feels gummy if touched. It is this sticky substance which the bees use to fill up the cracks and openings in the hive. They bring it in, and cover up the dead slug or moth with it, so that no harm can come from it.

If the intruder is a snail with a shell on its back, it will shrink back into its shell at the first sting it receives, and die inside. The bees then close up the mouth of the shell, and fasten it down to the floor.

**A new Swarm  
of Bees.**

When the hive is growing too crowded after the young bees have grown, and a young Queen is born, the old Queen generally leaves the hive with a number of bees, and sets up housekeeping somewhere else. Thus a new hive is formed, and life in the old hive goes on as before.

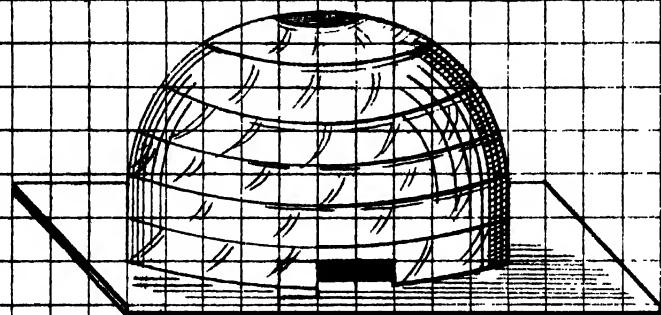
**Wild Bees.**

Wild bees do not live in hives. They make their own nests; but they gather honey, and make bee-bread and wax, and have a Queen, just like the hive or garden bees.

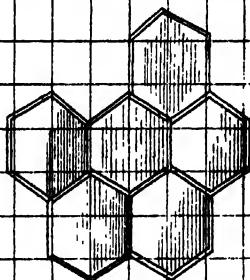
**The  
cleverness  
and ingenuity  
of Bees.**

Bees are wonderful little creatures. They live together in large numbers, yet each one knows its own particular work, and does it well and thoroughly.

They build, they make bee-bread and honey and wax; they nurse their young ones and guard their homes; they keep their homes clean and the air pure; they are governed



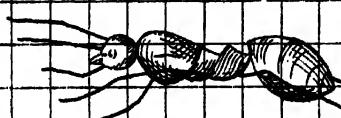
HIVE



CELLS



BEE



ANT  
(ENLARGED)



ANT HILL



by laws, and everything is done in order ; they help each other, and combine against their enemies. Indeed, their cleverness, good sense, industry, and ingenuity, place them among the most wonderful of all insects.

#### CHAPTER IV.

#### DESCRIPTION OF THE ANT.

The ant is a small insect. It has a slender body and long legs.

The divisions of the body of the ant are very well marked. The head is joined to the chest by a long, thin neck, and the third division of the body is like a little round ball.

In this country the ant is dark coloured, but in other lands there are both red and white ants.

It has a pair of bent feelers, which are very useful to it. It touches everything it comes across with them, and when it meets another ant it can make it understand what it wishes it to know by means of these feelers.

The mouth has very strong jaws, which are the tools of the little animal. With them it can pinch, bite, cut, dig, build, pull, carry, and fight.

The legs are long—the back pair are the longest. Each pair has a fringe of short hairs, which the ant uses as brushes.

The male and female ants have four light transparent wings, but the workers have none.

Some ants have stings. The ant belongs to the same family of insects as the bee.

Ants live together in large numbers as bees do, and, like them, they are divided into males, females, and workers.

The working-bees need wings, for they have to fly to the flowers ; but the working-ants do not need them, for, as a rule, their work is on the ground, and their long legs carry them rapidly wherever they wish to go.

## CHAPTER V.

### THE LIFE HISTORY OF THE ANT.

#### The Ant-hill.

The ant-hill is the home of the ants. It is a most wonderful structure. The outside of it is a little hillock or mound composed of sticks, leaves, twigs, and earth, but the inside is a perfect series of passages and rooms. In the centre of the nest is a large open space or hall, the roof of which is held up by pillars of earth.

The workers, who do all the work of the community, first hollow out a hole in the soil, and carry all the rubbish and earth out of it to the top, where it helps to form the mound or hillock. This hillock protects the nest, which runs underground.

When a shower has damped the soil, the little creatures roll it into tiny balls, and these are the bricks with which they build. They carry them into the nest, and make their roofs and walls with them in the most wonderful way.

Each ant has its own particular work, and all are hurrying about from morning till night, as busy as they can be. But although they are running about in such numbers, they never get in one another's way, or hinder one another.

The openings in the ant-hill are the mouths of passages which all lead to the large hall. It is in this hall that the greater number of ants live, but there are many other rooms beside.

There is only one Queen, or mother-bee, in the hive, but in the ant-hill there are a number of mother-ants. They do not place their eggs in the rooms provided for them, but leave them on the floor. The nurses at once pick them up, and quickly run away with them to the nurseries which have been prepared for them. The eggs are very, very small, and of a long shape.

The Nursing  
Ants.

When the grubs come out of the eggs the nurses take the greatest care of them. If the sun is warm they carry them out, and lay them where it will shine on them, and when it grows too hot they take them into the shade. They feed them with sweet juices, they brush them all over and clean them, and spend all their time in looking after the little ones. When the grubs have grown to a certain size they spin a silky covering round themselves, and lie perfectly quiet for some time. They do not eat in this chrysalis state. When the time comes for them to come out of this covering, the nurses help them to tear it open. The young ants are very weak at first, but the nurses tend them, and care for them for a few days, till they grow strong.

Great care is taken of the mother-ants, too. They are watched over in their own special rooms, so that no harm may come to them; they are fed and tended in every possible way.

The ants of one family have a great affection for each other. They never quarrel among themselves, and although they may fight with other ants, they are always kind to members of their own nest.

How Ants help  
each other.

No matter how far from home two of them may meet, they know each other, and if by any means some of the ants have been separated from the rest for a length of time, as soon as they are united they run together, and caress each other with their feelers, and show signs of joy at seeing their friends again.

If an ant is working so busily that it has not time to go and look for food, it will touch a passing comrade with its feelers, and make it understand that it feels hungry. The second ant soon brings it some food, and it goes on with its work as cheerfully as before.

It very often occurs that an ant will try to carry a load much too heavy for it. But as soon as its friends see it they will run and assist it with its burden to the ant-hill. Or should an accident happen to one, and it is disabled, its friends will help it home, or even carry it, and treat it with the utmost tenderness.

Danger comes sometimes to the ant-hill, but the workers do not run off as fast as they can to save themselves. They think, first of all, of the eggs and the young ones, and the ants that are old or sick. They carry them all out of the nest, taking care that not one is left behind. Then, if the nest is destroyed, or is not fit to live in any longer, they set off to find a new home, all travelling together in a body.

**How the Ant-hill is guarded.** In the evening the openings of the passages into the outer air are closed, and sentinels guard them, so that the ants may sleep in safety. As soon as the sun rises, those ants that are nearest the roof, and waken first, go and touch the others to tell them a new day has begun. Then the doors are opened, and the day's work commences. But if the morning is wet, the ants stay indoors, and the passages remain closed till the weather is fine again.

The ants make several outlets from the nest, which they disguise in such a manner that they cannot be easily seen.\* Then if enemies block the regular doors, or enter by them, the ants escape by the hidden outlets.

**Soldier Ants.** It happens sometimes that for one reason or another the inhabitants of one ant-hill will make war upon the inhabitants of another ant-hill. They start out in a body, and travel till

they reach the home of their enemies. It may be that the attack is expected, and they will find all the doors closed and guarded. If they are unable to gain an entrance, they will return as they came. But suppose that they take their enemies by surprise. Then they rush upon the ant hill, and a battle takes place. Whichever army wins will make prisoners of the beaten ones, and march them off to their nest. Here the prisoners become slaves or servants, and very hard their masters make them work. Not only do the victorious ants take their enemies prisoner, but they carry away the eggs and grubs to their own nest. The nursing ants bring them up quite as carefully as their own little charges, but when they are full-grown they too become slaves.

Ants are very fond of anything sweet. Fruit, honey, and sweet juices are their favourite food. But they will also kill other insects for food. They can carry flies, caterpillars, and other insects much larger than themselves into the nest. The Food of Ants.

In the winter the ants do not eat, but lie asleep at the bottom of the nest till the cold days are over.

The bee is a very wonderful little creature, but the ant is more wonderful still. It has been called "Nature's master-piece," and, indeed, if man is excepted, it has no equal among living creatures for ingenuity, cleverness, and industry. The Intelligence and Industry of the Ant.

Many animals have intelligence and reasoning powers; some have the knowledge how best to construct nests or dwelling-places; some show great ingenuity in their methods of finding food; almost all show affection for their young ones; but *all* these qualities are combined in the ant.

The ant digs and builds, defends its home, nurses its young, has numerous means of procuring food, makes plans and carries them out, perseveres under great difficulties, shows great affection and unselfishness, shows also great hatred, fights with its enemies and takes prisoners of war, and works

harder and achieves more than the strongest man, that is, if its work is estimated by its size.

How marvellous it is that so much sense, wisdom, and intelligence guide the actions of a creature so small that it could easily be crushed by a finger-tip!

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## CHAPTER V.

### DESCRIPTION OF THE BUTTERFLY.

The butterfly is an object of interest to everyone. When it is seen flitting about among the flowers, it is a sign that warm summer weather has commenced.

The butterfly is one of the most beautiful of insects, with its long, graceful body, and broad, beautifully tinted wings.

The body is slender and well shaped. The head is joined to the thorax by a neck. The thorax and the lowest part of the body are oval in shape.

The eyes are very large. The butterfly needs large eyes, because it has many enemies, and its quick sight often enables it to escape them.

It is very easily seen as it flies about in the sunshine with its bright wings outspread, and the birds do their best to catch it. But it is not very easily caught. A bird may chase a butterfly for a long time before catching it. It has a strange manner of flying. It does not fly straight through the air, as a bird does, but it flutters hither and thither, rising and falling, and making unexpected turns.

When a child chases a butterfly and tries to catch it, he may often get quite near to it, and think he is just on the point of securing it, when it flutters far away out of his reach. The pretty butterfly would not have much chance of escaping

its enemies if its eyes were not formed for seeing quickly, and in all directions.

The feelers are long, and thickened into knobs at the tips.

The mouth is formed for sucking. It has a long trunk, which it can curl up. The butterfly feeds on the sweet juices of the flowers. When it settles on a flower, and wishes to sip the juice concealed in it, it uncurls this long trunk and plunges it down into the flower until it reaches the tiny drop of juice, which it drinks up.

The butterfly has not strong jaws like the bee and the ant, because it does not need them. They require their strong jaws for tools, but the butterfly does not work, so its mouth is only fitted for obtaining its food.

It has six legs. Sometimes they seem feeble, and not very suitable for walking. But when the butterfly is resting on a flower, and a strong breeze is blowing, it can cling very securely with its legs to the flower, and so prevent itself from being blown away.

The wings are of more importance to the butterfly than the legs. When not resting it is generally on the wing.

It has two pairs of wings, large and bright-coloured. The bee and the fly have transparent wings, but the butterfly's wings are very different. They are covered with tiny scales, so small that they look like the finest powder. If a child were to hold a butterfly in his hand, he would find his hand dusted with a coloured powder from the wings of the insect. If this dust or powder were placed under a strong magnifying glass, it would be found to be scales, which fit one over the edge of the other, and make the beautiful colouring of the wings.

Some butterflies are large, and some small, and they are of many lovely colours.

There are white, red, blue, and brown butterflies. All tints and colours may be found in the numerous varieties.

The wings are not only richly tinted, they are marked with patterns of a contrasting colour.

Some butterflies have wings of bright tints, with dark spots and markings. Others have dark wings, with brilliant spots and markings. There is endless variety in these charming and wonderful insects.

The life of the butterfly is not a long one, for soon after it has laid its eggs it dies.

It places its eggs where it knows there will be plenty of food for the young ones when they are born.

The ant and the bee feed and tend their young ones, but as the butterfly cannot do this, it provides for its young ones in another way—that is, by placing the eggs where the little caterpillars can find food for themselves as soon as they leave the eggs.

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## CHAPTER VI.

### THE LIFE HISTORY OF THE BUTTERFLY.

The grub which comes from the egg of the butterfly has a long, soft body, formed of twelve rings. It is called a caterpillar. The word means "a robber," and it is certain that this insect soon robs a plant of its leaves.

The head is small. The first three rings next to the head compose the chest or thorax, and the remaining nine compose the body or abdomen.

It has been said in the lesson on an Insect that all insects have six legs. It would seem as if this were not true in the case of the caterpillar, for some have six, some eight or ten,

and some sixteen legs. But only six of these are real legs, and they are attached to the chest, as the legs of all insects are. The remaining ones, which are not perfect legs, are attached to the lower part of the body.

The eggs of the butterfly have been placed by it on the plant which will best nourish the caterpillars when they are born.

There are many different kinds of butterflies, and each particular kind chooses its own special plant, so that the food is ready and waiting for the young caterpillars. Some butterflies lay their eggs on cabbages, some on nettles, and many on the leaves of trees and shrubs.

As soon as the caterpillar comes out of the egg it begins to feed. It is small at first, but it grows very quickly indeed, because it eats so fast and so greedily. It begins at the edge of a leaf usually, and eats all round it, cutting the bits off with its mouth as neatly as if it were done with a little saw.

The young of the ant and the bee are fed on almost the same kind of food as the full-grown ant and bee, but the caterpillar, though really the same insect as the butterfly, has a totally different kind of food in this stage from what it has when it becomes a perfect insect.

It is plain, therefore, that the juice-sipping trunk of the butterfly would not be at all suitable for the caterpillar feeding on solid food. So it is provided with strong jaws, with which it can cut the leaves upon which it feeds.

Most caterpillars eat during the night and rest during the day. Some are so greedy that they eat nearly all the time.

There is as much difference and variety among caterpillars as there is among butterflies.

These soft-bodied little creatures form the food of a great number of birds. If it were not so, they would soon become too numerous and troublesome.

The birds are darting about all day long, looking everywhere with their quick eyes for food for themselves and the hungry young ones in their nests. But although the caterpillars seem so helpless, they have their own peculiar ways of hiding and protecting themselves.

Many of them are exactly the colour of the leaves upon which they feed, and when they are lying quietly underneath the leaves, they are not very easily found, even by the birds.

Others are the colour of the bark of the trees, and they can put themselves into such strange positions when they are resting, that they look exactly like little sticks or twigs, and no one who did not look very closely indeed at them would ever imagine that they were living caterpillars. Some caterpillars are covered with long hairs. These are very common, and children often call them "woolly bears."

It is not at all likely that a bird would care to feel this caterpillar with its long hair sticking in its throat, and probably it would leave this hairy insect alone unless it were very hungry indeed.

Many caterpillars can spin silken thread from the mouth. Those that feed upon the leaves of trees often let themselves down from one branch or leaf to another by this thread.

While this insect is still a caterpillar it changes its skin several times.

Perhaps, as it eats so much and grows so rapidly, its skin becomes too tight for it. A day or two before getting a new coat it stops eating, and its colour fades, and it does not seem inclined to move. When it has lain quiet for a while the skin cracks down the back, and out comes the caterpillar clad in a new bright suit, and commences eating away again as hard as ever.

When this has happened several times, and the caterpillar has grown to its full size, the last change of all takes

place. It stops eating, loses its colour, and moves very slowly. Some caterpillars spin themselves a coat or case of silk, called a cocoon, in which to lie during this last stage, before the appearance of the perfect insect. The silkworm does this—it is a caterpillar, not a worm at all. It is by carefully unwinding the threads of its cocoon that silk is obtained.

Some caterpillars fasten two or three leaves together round their bodies to protect them, and some spin belts round themselves, and in this way fasten their bodies to stems and leaves of plants, to keep them from falling.

In this chrysalis state the caterpillar neither eats nor moves, it scarcely seems to live. The skin becomes smooth and horny, and is often brown in colour. The insect is wrapped up within this dark shell, and is as motionless as if it were dead. It remains in this state for some time. At last the dry, hard skin cracks, and the perfect insect—the butterfly—appears. Its wings are short and crumpled at first, but they soon straighten themselves out, and away the lovely creature flies to enjoy its short life in the sunshine.

The moth belongs to the same family as the butterfly. It undergoes the same changes as the butterfly, and is like it in a great many respects, but still there are a number of points of difference between the two insects.

As a rule moths are of more sober colours than butterflies, though there are many bright coloured ones.

For the size of the moth, the body is much heavier than that of the butterfly, and not as pretty in shape. The butterfly has a waist between the chest and the body, but the moth's body is the same thickness all the way down.

The feelers of the moth end in points, and not in knobs, like those of the butterfly.

A few moths come out in the day time, but as a rule they fly about in the evening and night.

The difference  
between  
Moths and  
Butterflies.

Many flowers give out a stronger scent by night than by day, and no doubt this strong perfume attracts the moths.

When at rest, the wings of the moth lie flat on the back. When the butterfly rests, it folds its wings together ; they look like the petal of a flower in this position.

The caterpillars of moths feed on many things besides plants. Some of them are large, and some very tiny. One of the smallest becomes the clothes-moth, which everyone knows and dislikes. Many people think it is the moth which eats their clothes, but this is not so.

The moth lays its eggs among clothes, furs, &c., and when the caterpillars come out of the eggs they do the mischief, by eating the cloth, &c., and making holes in it.

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## CHAPTER VIII.

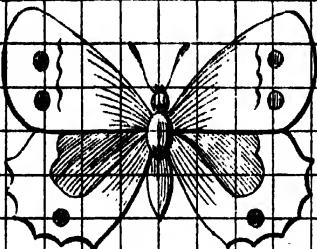
### THE HOUSE FLY.

This little insect is well known to everyone.

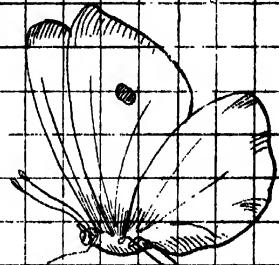
It is dark coloured, the front of the head is black, and the sides are yellow. The body is lighter-coloured underneath than on the back.

The eyes are two in number. They are very large as compared with the size of the fly, and they take up most of its head. These large eyes enable it to see very quickly. How difficult it is to catch a fly ! Even when it is quite still it is on the watch, and flies away in a moment if anyone tries to catch it. It needs large eyes in order to find its food, and to enable it to keep out of danger.

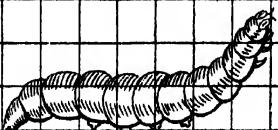
Its mouth is formed for sucking up food. It lives on many kinds of food—sweets, fruits, vegetable juices—anything that has been thrown away as unfit for use, the fly will settle upon.



BUTTERFLY WITH WINGS OPEN



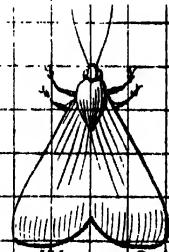
BUTTERFLY WITH WINGS CLOSED



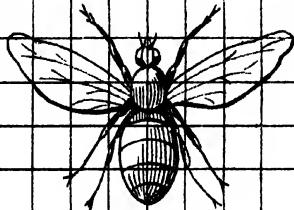
CATERPILLAR



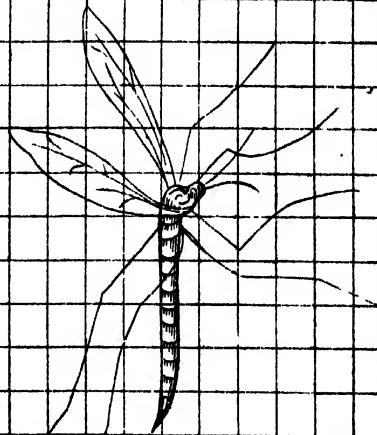
CHRYsalis



MOTH WITH WINGS CLOSED



BLUEBOTTLE FLY.



DADDY LONG LEGS



But if the mouth is only formed for sucking, how is it that the fly is so fond of sugar? Because it knows how to melt the sugar. The sugar is formed of hard grains, and therefore cannot be sucked up. The fly has a fluid in its body with which it can damp it. It can bring a tiny drop of this fluid to the end of its trunk, and let it fall upon the grain of sugar. Then, when it has melted, it can suck up the sweet drop.

The legs are thin and black, almost like hairs. With its six delicate legs the fly can walk very quickly.

The fly has two very light gauzy wings. It can fly most rapidly.

In summer the air is full of flies; they get into the houses in such large numbers as to become very troublesome.

They have many enemies. Numbers of birds feed upon them, and so does the spider.

In the hot weather, when they abound in such large numbers as to be annoying to men and animals, people try every means in their power to get rid of them.

But for all that they are very useful in their own way.

They feed on decaying substances, which, if left alone, would render the air impure.

When the cold weather comes, they die or hide in corners till the summer returns.

Flies lay their eggs on plants or dirt heaps, where the little grubs come out, and in time become flies.

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## CHAPTER IX.

## THE BLUE-BOTTLE FLY.

This fly is very like the house-fly in shape, but it is larger and of a much prettier colour.

Its body is of a brilliant blue colour, and shines as if it were polished. It takes its name from its colour.

It makes a loud buzzing sound when it flies.

It is often called the meat-fly, and many people think that it lives on meat. But this is not the case. Its food is very like that of the house-fly, and its mouth is only formed for sucking.

Yet it is always hunted out of the pantry, for everyone knows that it will spoil any meat upon which it settles.

The blue-bottle lays its eggs on fresh meat, in a mass containing a large number of long-shaped eggs. In about twenty-four hours the little grubs come out. It is these grubs that spoil the meat; for they bury themselves in it, and at once begin to feed. When they have eaten greedily for several days, they leave the meat and bury themselves in the ground.

This is the chrysalis stage, and they lie as if dead for several days.

Then the fly appears from the end of the chrysalis where the head of the grub has lain. At first it is of a grey colour, but in a few hours it changes its colour, and becomes the blue-bottle that is so well known.

## CHAPTER X.

## THE DADDY LONG-LEGS.

The daddy long-legs is a two-winged insect. Its body is very long and slender, and it has two long, narrow wings. The head is small and round ; the eyes are large.

This insect takes its name from the length of its legs. All the six legs are very long, but the hind pair are about three times as long as its body.

Before the grub becomes the perfect insect, it lives on plants in the fields and gardens.

Children know the daddy long-legs very well. It dances up and down, with outspread wings, on the top of the long grass in hot, sunny weather. As a rule, it does not fly very far, and it keeps near the ground.

It is very common in the end of summer, about September and the beginning of October.

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## PART III.—SEA ANIMALS.

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### CHAPTER I.

#### INTRODUCTION.

Most children have seen the sea—that vast expanse of water that is always moving, and never at rest.

The colour of the sea is always changing. On a bright day it is blue and sparkling, and reflects the colours of the sky. Near the shore it becomes green ; sometimes light, and sometimes dark, in tint. On a dull day it will look grey, and, in the distance, almost black.

There are many causes for the beautiful changes of colour in the sea.

If a cupful of water were lifted from the sea, it would be quite clear and colourless.

In most parts the sea is very deep ; near the shore it is shallower, as a rule.

The bottom of the sea is not a level surface, but full of hills and valleys, as the land is ; so that the depth of the sea varies very much.

These hills and valleys are covered with plants and forests of lovely and brilliant colours. Among them live all kinds of strange and wonderful creatures, which creep, and run, and swim, and live their lives and die there. Some of these creatures swim about as fishes ; some live in shells and strange dwellings ; some appear to be brightly coloured plants, and not living animals, as they really are.

The sea is full of life ; there is much more life in the sea than on the land.

On the sea-shore are often to be found shells that have been the homes of little creatures. Strange plants which we call seaweeds are also washed up by the sea. A handful of sand from the sea-shore, if placed under a strong magnifying glass, would be found to contain shells of curious shapes. These shells are so small that, without a glass, they appear to be sand.

When the tide goes down, many living creatures may be found on the shore—sea anemones growing on the rocks in the form of wonderful plants, crabs, mussels, cockles, limpets, and hosts of strange creatures.

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## CHAPTER II.

### T H E S P O N G E.

A sponge is a familiar object to all children, but how few of them dream that it was once the home of a jelly animal, and grew far below the surface of the sea!

Sponges are not all the same size or shape, but they are mostly of an irregular circular shape, and pale brown in colour.

A sponge is very light, and full of holes, which run right through it, forming passages. If squeezed in the hand tightly it would go into small compass, but as soon as the hand is opened it would spring back again to its natural size.

If dipped into a bowl of water, it would absorb or suck up the water till it could hold no more. It would then feel heavy, because it has the power of holding a quantity of water; but when squeezed dry again it would be as light as ever.

When it was alive and growing below the waves, it was filled with jelly. Through the passages in its framework the sea-water flowed and supplied it with food.

As soon as one of these strange animals comes out of the sponge-egg it floats away—a little speck of jelly, and swims about until it finds a place to settle in. Then it fastens itself to a rock or other object. It grows larger and larger, and by-and-by holes appear in the little mass of jelly, and passages run through it, and so the perfect sponge is formed.

When growing, sponges look very beautiful—often they are brilliantly coloured.

In the summer, sponge-fishers fish for them with hooks, and tear them from the rocks. Then they squeeze the jelly from the framework, which is the more solid part of the animal's body, and prepare the framework for sale.

The finer sponges are found in deep water, and often the fishers dive into the sea for them, and take them from the rocks with a knife, so as not to injure them.

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### CHAPTER III.

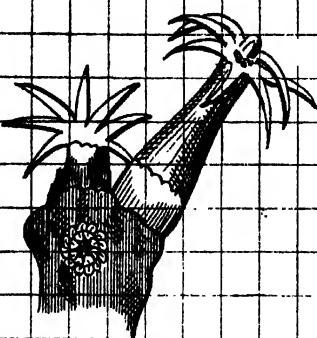
#### THE CORAL ANIMAL.

Coral is formed by jelly animals. These wonderful little creatures live in the sea, and draw in for their food substances from the water, which harden and form coral.

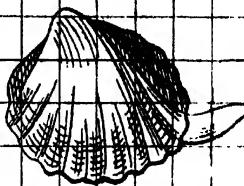
When they are young, their bodies are soft and jelly-like ; but as they grow older, part of their bodies gradually hardens.

The part which is attached to the rock becomes solid, and forms a home for the little creature, so that the coral animal, like the sponge, makes its dwelling-place from its own body.

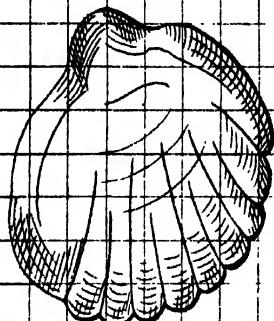
The stomach, mouth, and feelers always remain soft. The body is shaped like a bag. At the top is a hole, which is the mouth. All round this mouth is a fringe of feelers, which can be drawn in or put out as the animal pleases. The ocean



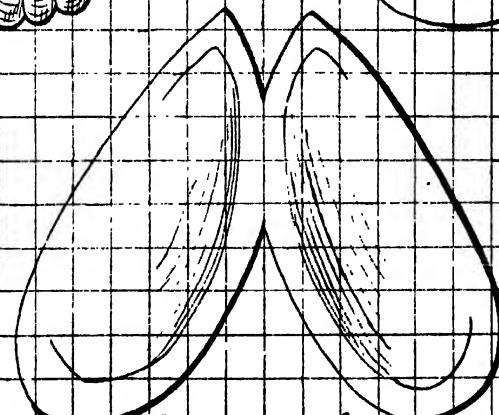
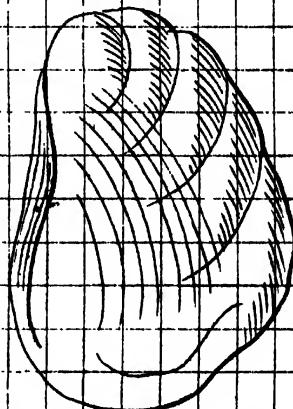
CORAL ANIMALS



COCKLE SHOWING FOOT



OYSTER  
SHELLS



MUSSEL SHELLS



carries its food to it, and the feelers are the traps which catch the food as it floats near.

The coral animal can draw the whole of the soft part of its body within the hard part, just as a snail shrinks into its shell.

These jelly animals have the power of throwing out little buds or knobs, which are their young ones, and which gradually harden in the manner described.

When the animal dies, the hard part remains just as it was. One little formation branches out from another until masses are formed full of tiny holes or cells, where the little creatures have lived.

Millions of these wonderful animals are working away beneath the sea—drawing in the particles of lime from the water, and forming it into coral in their own bodies. There are such multitudes of them, and they go on multiplying so unceasingly, that the coral they form rises from the depths of the sea in solid white rocks, till at length it reaches the surface. Then the coral animals can build no longer, for they must be covered by the water or they cannot live. But the coral remains branching up in great masses, miles in extent, and the sea washes all kinds of substances on to the coral reef or ridge, which stay there and accumulate, and, in time, form islands.

The coral which forms reefs is called ‘stone coral.’ There are also pink and red coral. It is formed in just the same way as the stone coral, but these coral animals have the power of drawing something from the water with which they can colour the hard parts of their bodies. The soft parts always keep pure white. It is from the pink and red coral that ornaments are made.

## CHAPTER IV. B I V A L V E S.

### The Mussel, the Cockle, and the Oyster.

These three animals are called bivalves, because each of them lives in a shell which is divided into two parts. The two parts are fastened together by a strong hinge, and the animal inside can open or shut it as it pleases. A valve can be opened or shut like a door, so these animals are called 'bivalves,' a word meaning two valves, or, in this case, two shells. Some animals are called 'univalves.' That means a shell in one piece, instead of in two. The periwinkle and the snail are univalves.

The mussel, cockle, and oyster have soft, shapeless bodies. They have the power of forming shells for themselves from the particles of lime which they draw from the sea. If they had no shells to protect their soft bodies, they would soon be snapped up and eaten by fishes and sea-birds.

The outside of the shells may be rough, but the insides are smooth and polished. If the insides were rough and prickly, they would hurt the soft bodies of the animals. Many people think that this is the reason why the smooth, beautiful pearls are formed in oyster shells. They think that, perhaps, a grain of sand or something that hurts the oyster gets inside the shell by accident, and as it cannot get rid of it, it covers it over with this smooth substance so that it will not be uncomfortable to its tender body. The shell itself is made from the same substance, and the inside lining is called 'mother of pearl,' but the tiny pearl is more beautiful, and is very highly prized.

## CHAPTER V.

## THE MUSSEL.

The mussel has a smooth, polished, dark-coloured shell, long shaped, and divided into two parts, fastened together by a hinge. The mussel has a long narrow foot, which it can put out. From this foot it spins hairs, by which it anchors itself to rocks, stones, and other objects.

When the tide goes down, mussels may be seen in hundreds tightly fastened to the rocks or wooden stakes of piers, &c., and all the shells closely shut. But when they are covered by the sea-water the shells open, so that the mussel may obtain its food.

There it lies, with the shell partly open, and a sort of fringe appearing. This fringe it moves about very rapidly, and makes the water whirl round and round. Then any tiny animals that are near are carried into the moving water, and the mussel soon draws them into its shell for food.

When the tide is going down, it fills its shell quite full of water, then tightly closes it. With this supply it must be satisfied until the sea-water covers it again.

This is the reason why mussels are always found fast shut when the tide is down; but as soon as they feel the water creeping over them again, as the tide rises, they open their shells and begin feeding.

Mussels live together in great numbers, but they have the power of moving about, although it is only very slowly. They throw the little hairs spun from the foot round objects, and pull themselves along,—a very short distance at a time. It is with these hairs that they cling so tightly to the stones, &c.

## CHAPTER VI.

## THE COCKLE.

The cockle is smaller than the mussel, and its shell is of a different shape. Its body is soft, like that of the mussel, but it has a longer foot, with which it can jump very quickly along the sand. It puts its foot out as far as it can and presses it against the sand, bending it at the same time. It then suddenly lets itself go with a spring, and this is how it leaps along.

It can bore into the sand with its foot and bury itself, all except the rim of its shell ; and there it can lie and hide, with its shell open and the sea washing over it, from which, like the mussel, it draws its food.

When the tide is out, people at the seaside go and gather cockles and mussels. They find the cockles on the sandbank, and the mussels clinging to the rocks, stones, posts, &c.

The shell of the cockle is of a whitish colour, shaded round the edges with yellow or brown.

## CHAPTER VII.

## THE OYSTER.

The oyster is larger than the mussel and the cockle. Its shell is larger, and is white, tinged with grey. The oyster feeds, like the mussel and cockle, with its shell open, and the fringe moving the water and carrying the food into the shell. The mussel can move a little, and the cockle can leap over

the sand quickly, but after the oyster has once found a resting place, it never leaves it. There it remains for the rest of its life, until it dies, or is gathered for food.

The oyster keeps its eggs within its shell until the young ones are hatched. The little oysters are so small when they leave the eggs, that they look almost like dust or powder. They can swim then, and they swim about until they find a place that suits them, where they settle down and stay for the rest of their lives.

Oysters live together in immense numbers, on banks which are covered by the sea. Unlike the mussel and cockle, which are left bare twice a day when the tide goes down, the oyster is always under water. The banks upon which oysters live are called "oyster beds."

Oysters, mussels, and cockles are very good for food, and people eat them in large numbers.



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